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The Korean labour market: Some historical macroeconomic perspectives

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Preface

The primary goal of the ILO is to contribute, with member States, to achieve full and productive employment and decent work for all, including women and young people, a goal embedded in the ILO Declaration 2008 on *Social Justice for a Fair Globalization, and*[1] which has now been widely adopted by the international community.

In order to support member States and the social partners to reach the goal, the ILO pursues a Decent Work Agenda which comprises four interrelated areas: Respect for fundamental worker's rights and international labour standards, employment promotion, social protection and social dialogue. Explanations of this integrated approach and related challenges are contained in a number of key documents: in those explaining and elaborating the concept of decent work[2], in the Employment Policy Convention, 1964 (No. 122), and in the Global Employment Agenda.

The Global Employment Agenda was developed by the ILO through tripartite consensus of its Governing Body's Employment and Social Policy Committee. Since its adoption in 2003 it has been further articulated and made more operational and today it constitutes the basic framework through which the ILO pursues the objective of placing employment at the centre of economic and social policies.[3]

The Employment Sector is fully engaged in the implementation of the Global Employment Agenda, and is doing so through a large range of technical support and capacity building activities, advisory services and policy research. As part of its research and publications programme, the Employment Sector promotes knowledge-generation around key policy issues and topics conforming to the core elements of the Global Employment Agenda and the Decent Work Agenda. The Sector's publications consist of books, monographs, working papers, employment reports and policy briefs.[4]

The *Employment Working Papers* series is designed to disseminate the main findings of research initiatives undertaken by the various departments and programmes of the Sector. The working papers are intended to encourage exchange of ideas and to stimulate debate. The views expressed are the responsibility of the author(s) and do not necessarily represent those of the ILO.

José Manuel Salazar-Xirinachs
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[1] See http://www.ilo.org/public/english/bureau/dgo/download/dg_announce_en.pdf
[2] See the successive Reports of the Director-General to the International Labour Conference: *Decent work* (1999); *Reducing the decent work deficit: A global challenge* (2001); *Working out of poverty* (2003).
[3] See http://www.ilo.org/gea. And in particular: *Implementing the Global Employment Agenda: Employment strategies in support of decent work, "Vision" document*, ILO, 2006.
[4] See http://www.ilo.org/employment.

Foreword

As part of the ILO/Korea partnership programme, this study was commissioned to Zooyob Anne, a senior researcher in Korea Labour Institute, conducting investigation on the relationships between the macroeconomic variables of employment, investment and economic output. The main objective of the research was to clarify empirically whether a slowdown in employment growth is a cause for concern and whether achieving higher economic growth rate would indeed result in more and better jobs.

Korea is a very specific case study, which has achieved a remarkably fast and inclusive economic growth process in the past. The turnaround in the Korean employment situation took place after the foreign exchange crisis in the late 1997 and 1998. Since then, there have been debates on "jobless growth" and "labour force polarization" in the context of emerging economic situation in the 2000s. The 2000s had also been marked by a rapid onset of ageing process, which more than ever urgently calls for active and productive participation of all persons in their working age. The current paper provides some clarifications on the debate on "jobless growth": even though the structural ties between economic growth and employment may have indeed been weakened over time and more noticeably after the 1997 crisis, achieving faster economic growth would most likely generate sufficient quantity of employment. What requires further research and clarification is whether the current growth process and institutions would indeed ensure more jobs with some security and/or adequate compensation. A decade after the unprecedented economic crisis that Korea had faced in 1997/8, another externally generated crisis has hit the country.

Further in-depth exploration of labour market institutions, conditions of work, and relationship between growth and employment are still needed, to evaluate the adequacy of policy responses and subsequent institutional changes in the past and present economic crisis.

Makiko Matsumoto, a research economist in the Employment Policy Department of the ILO, provided overall technical supervision to the development, finalization and publication of the paper. The paper also benefited from technical comments and reviews by ILO colleagues: In-Kon Kim and Duncan Campbell.

The paper provides some historical perspectives on Korean economic and social achievements and highlights emerging employment challenges that the country has been facing in the recent past. We would like it to be read as one of the basis for more employment-focused research and policy actions.

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1. Introduction

In the recent past, many countries around the world, both developing and developed, have experienced spells of good economic growth. Nonetheless, there have been increasing concerns that the process of recent growth was not accompanied by enough employment. In standard macroeconomic analysis, all too often, economic growth is taken as a phenomenon of primary interest that needs to be explained and attained. Recent macroeconomic analysis delves increasingly into different institutional frameworks and political processes that are the fundamental causes of economic growth. But their effect on the population's working lives remains ambiguous. In empirical analysis, growth in output per worker or per hour worked is taken as a phenomenon of interest, which is sometimes translated into output per capita in less careful empirical work. With such approach, the contributions workers make towards generating economic growth, as well as the extent to which they can benefit from better economic climate, become unclear. And in countries where inactivity rate of some segments of the population is large or where there is high unemployment, separately examining output and employment would be more revealing. Moreover, the supply of labour also responds to the perceptions on job opportunities available in the market.

The current paper attempts to provide some evidence on the relationship between investment, output and employment in Korea between 1970 and 2007. It recognizes that the focus is limited, and misses out in the empirical analysis other important factors that drive complex economic system such as the Korean one. Nonetheless, it shows that not enough employment growth has taken place in relation to population growth in the recent decade. This was partly driven by slowdown in economic growth, slowdown in average investment growth rate, and a possible marginalization of increasing number of non-regular workers whose risk of unemployment and inactivity are high during economic downturns.

1.1 A brief history of economic growth and employment

The Korean economy has experienced a remarkable and uninterrupted history of growth and development until the foreign exchange crisis at the end of 1997. In spite of the first and the second oil shocks in 1973 and 1979, economic growth between 1970 and 1996 recorded an annual average of 7.9 percent. Such high economic growth rate was enough to absorb the labour force released from the rural areas at the onset of industrialization and urbanization. Employment grew at an average annual rate of 3.0 percent over the period, exceeding the growth rate of economically active population, which averaged 2.6 percent. Another noteworthy feature about the past process of economic development was that it had been a remarkably inclusive process, where rapid economic growth was accompanied by social equality.

The 1997 foreign exchange crisis had a dramatic and profound effect on economic and employment performance. In 1997, the annual economic growth rate plunged to minus 6.9 percent and the employment growth rate to minus 6.0 percent. Such a strong negative downturn was unprecedented.[5] As a result, the unemployment rate soared to a historically high 7.0 percent, from a near full-employment rate of unemployment of 2.0 percent in

[5] The only other times when Korea experienced a negative economic growth rate were in 1980 (-1.5 percent) and 1984 (-0.5 percent).

1996. The number of unemployed more than doubled from 0.6 million in 1997 to 1.5 million in 1998.

Even ten years after the crisis, economic growth has remained sluggish, employment growth has remained at a low level, and the overall employment-to-population ratio of 59.8 percent in 2007 still fell short of 60.9 percent just before the crisis in 1997. This is a call for concern since such decline in employment-to-population ratio took place despite the rapid decline in working age population due to a marked and rapid entry into ageing society around 1999. The rate at which society is ageing is quite unique in Korea because it is occurring in a very short time span compared to that of other nations and the age structure is fairly unbalanced. In order to meet the social and economic repercussions of an ageing society, active labour market participation of the current and future working age population will play a key role.

1.2 The main issues and debate in employment

Perverse economic and labour market performance over the last ten years has raised many concerns associated with the structure of the economy. One of the hottest issues facing the Korean labour market can be summarized in terms of “jobless growth” in times of rapidly ageing society, and more contentiously “labour force polarization”. There is a concern that a moderate but steady economic growth will not generate enough employment. The link between economic growth and the labour market may have been weakened since the late 1990s, and the processes that generate economic growth may no longer lead to sufficiently large employment growth. The debate on jobless growth emerged when employment fell in 2003, eventhough economic growth was positive. Since then, many researchers and policymakers have espoused this pessimistic view of the labour market.

If we disaggregate employment growth to that of wage and salaried employment and of the self-employed, decline in 2003 owed mainly to a large decrease in the number of self-employed by 252 thousand or 3.5 percent, while the number of wage and salaried employment grew 1.6 percent or by 221 thousand. This suggests that the observed aggregate negative relationship between economic and employment growth in 2003 would be better understood as a result of restructuring of the self-employed. Following the foreign exchange crisis at the end of 1997, the government assisted the mass unemployed into self-employment, mainly in sectors such as wholesale and retail trade industry and restaurant and hotel industry, as part of job creation policy. Since then, self-employment grew at a steadily lower rate from 0.9 percent in 2004 to 0.1 percent in 2005,and subsequently contracted by -0.9 percent in 2006 and -1.8 percent in 2007.

Nonetheless, the question remains as to why job generation in wage and salaried employment has been limited in the recent years and fell short of fully absorbing workers who ceased to be self-employed and workers newly joining the labour market. The question also remains as to whether those who were once assisted into self-employment were once again re-employed into “regular” wage and salaried employment or if they only had access to less secure work under worse working conditions. This issue forms part of the concerns voiced in the labour force polarization debate that emerged in the 2000s, triggered by a process of corporate and economic restructuring after the 1997 crisis.

One of the structural changes in the economy that relate to an observed decline in employment growth was the shift in balance between growth in the manufacturing sector and that in the service sector. Over the last decade, the manufacturing sector kept a relatively high average annual growth rate of over 7 percent between 1996 and 2007, while growth in the service sector plummeted to 3.5 percent during 1996-2002 and further down to 3.2 percent during 2002-2007 in sharp contrast to the pre-crisis average of almost 8 percent between 1970 and 1996. Service sector is generally more labour intensive than the manufacturing sector, and lower growth rate in this sector contributed to lower employment

growth rate after the crisis. Furthermore, a higher growth rate in the manufacturing sector was led possibly by the least labour intensive industry, such as "manufacture of electronic components, computer, radio, television and communication equipment and apparatus". Such shifting weight in the growth sectors may have induced a negative growth rate of employment in the manufacturing sector. At the same time, the service sector absorbed a large portion of the unemployed and new labour market entrants after the crisis period; and its low growth rate gives a strong indication of low labour productivity and a limited capacity to sustain and improve earnings of workers in the sector.

The recent lower employment growth may be mainly attributed to lethargic economic growth but not necessarily to a lower potential of the economy to generate more employment. It is a widely accepted view that insufficient investment and deficiency in consumption over the last decade have been the main causes of such sluggish economic growth rate. Both gross capital formation and gross fixed capital formation grew at very low rates. Gross capital formation grew at -0.4 percent during 1996-2002 and recovered to 3.1 percent during 2002-2007; this contrasts sharply with the average growth rate of 11 percent between 1970 and 1996. The constraining effects of unsatisfactory investment growth on both economic and employment growth rates calls for accurate strategic policy measures to boost investment by providing incentives, in such a way as to induce economic restructuring for sustainable and efficient growth. This in turn may allow restoration of appropriate and sustainable employment growth. The urgency of achieving full employment and an enabling environment for productive participation of all workers are greater than ever due to rapidly ageing society. It still has to be remembered, however, that in the Korean context in the 2000s, it is not only the quantity of employment that matters but also the kind of jobs available. There has been a growing concern that the share of non-regular workers had been on the rise after the 1997 crisis, especially for women and youth.[6]

1.3 The objectives and organization of the study

The objective of this paper is to develop and strengthen the conceptual and empirical knowledge base on investment, growth and employment, with a view to highlighting some of the structural constraints faced by the Korean economy in the period after the 1997 financial crisis.

To fulfil the objective, the study addresses the following issues: (1) what is the empirical relationship between investment, output and employment?; and (2) is there sufficient investment taking place to generate economic growth process that is labour-intensive and that provides sufficient compensation for workers of all types?

The remainder is organized as follows. Section 2 provides the long-term trend in employment. Trend analysis is conducted to check whether declining trend in employment growth is of concern. Two categories of employment –wage and salaried employment and self-employment – are considered. A descriptive analysis of employment-to-population ratios by demographic groups is also conducted. Section 3 presents a conceptual framework that underpins the subsequent empirical section, which analyzes the dynamic employment effects of economic growth, investment and foreign direct investment (FDI). Section 4 visually and statistically analyzes relationships between the series on employment, output, and various types of investment. The empirical model used is vector autoregression (VAR)

[6] For example, see Grubb et al. (2007) and Yun (2009). Definition of non-regular versus regular workers requires a careful classification and detailed examination of the data. The definitional clarifications are provided in Ahn (2006) and Grubb et al. (2007).

model, which is one of the simplest and flexible forms of time-series analysis. The last section summarizes the main findings.

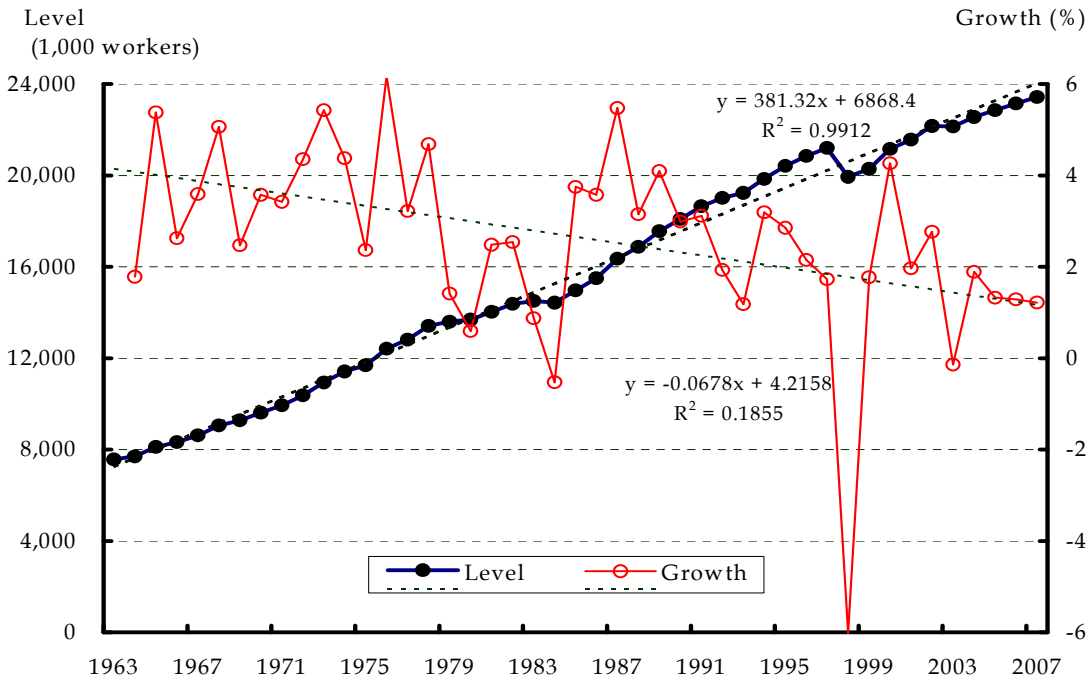
2. The long-term trend in employment

2.1 Employment and employment-to-population ratio

2.1.1 Declining growth in employment

During the last four decades or so, the total employment tripled from 8 million in 1963 to nearly 24 million in 2007 (figure 1), while increase in total population during the same period was less than a double, from 27 million to 49 million. Such rapid employment growth was mainly due to the historic speed of economic growth. According to the linear trend, about 400 thousand jobs had been added every year over the time period. Two important observations emerge from the figure: absolute decline in employment over the business cycle rarely occurred[7] and employment growth tended to slow down.

Figure 1 Long-term employment trend (1963-2007)



Source: NSO, KOSIS.

Absolute decline in employment was recorded three times in 1984, 1998 and 2003. Drops in 1984 at the peak of the third business cycle and in 2003 just after the peak of the

[7] The business cycle is officially reported by the National Statistical Office. According to the most recent revised report of the business cycle, there have been eight peaks since 1970: February 1974, 1979, 1984, January 1988, 1992, March 1996, August 2008, and December 2002. The last business cycle is proceeding after its peak and is expected to be a relatively longer cycle.

last business cycle were relatively moderate.[89] Reduction in employment in 1998 was due to the foreign exchange crisis that started at the end of 1997, and it was much larger than expected. The crisis destroyed 1.3 million jobs (more than 6 percent), and the unemployment rate soared to a record high level of 7.0 percent (1.5 million unemployed) from 2.6 percent (0.6 million unemployed) in 1997 or from a record low unemployment rate of 2.0 percent in 1996.[10] It took three years to restore the pre-crisis level of employment, while the employment rate did not regain the pre-crisis level of 60.9 percent. Employment growth rate also trended downward over the period, and it linearly decreased by 0.07 percentage points every year.

Examining average annual employment growth by sub-periods also shows its downward trend in table 1. Such downward trend is not a serious cause for concern if it was due to less "need" for employment because of better earnings or less population. However, despite a slowdown in growth in working age population, its growth rate consistently outweighed the growth in employment after 1996, while the reverse was the opposite in the previous periods.[11] Examination of earnings is necessary to reach any definitive understanding, but the data strongly suggests insufficiency in job opportunities after the 1997 crisis period.

Table 1 Long-term employment trend (units: 000s, %)

Year/ period	Emp (1)	UE (2)	WAP (3)	EPR (1)/(3)	WageEmp (4)	SelfEmp (5)	% Self =(5)/(1)	EPR1 (4)/(3)	EPR2 (5)/(3)
Level									
1970	9,617	445	17,468	55.1	3,746	5,872	61.1	21.4	33.6
1979	13,602	540	23,787	57.2	6,479	7,124	52.4	27.2	29.9
1988	16,869	435	29,602	57.0	9,610	7,260	43.0	32.5	24.5
1996	20,853	426	34,274	60.8	13,200	7,653	36.7	38.5	22.3
1997	21,214	556	34,851	60.9	13,404	7,810	36.8	38.5	22.4
1998	19,938	1,461	35,347	56.4	12,296	7,641	38.3	34.8	21.6
2002	22,169	752	36,963	60.0	14,181	7,988	36.0	38.4	21.6
2007	23,433	783	39,170	59.8	15,970	7,463	31.8	40.8	19.1
Average annual growth rate/change									
1970-07	2.44	2.11	2.21	0.13	4.00	0.65	-0.79	0.52	-0.39
1970-79	3.93	2.17	3.49	0.24	6.28	2.17	-0.96	0.64	-0.41
1979-88	2.42	-2.37	2.46	-0.02	4.48	0.21	-1.04	0.58	-0.60
1988-96	2.69	-0.23	1.85	0.48	4.05	0.66	-0.79	0.76	-0.27
1996-02	1.03	7.36	1.27	-0.14	1.20	0.72	-0.11	-0.02	-0.12
2002-07	1.12	0.81	1.17	-0.03	2.40	-1.35	-0.84	0.48	-0.51

[8] When employment dropped slightly in 1984 (by 76 thousand or by 0.6 percent) and in 2003 (by 30 thousand or by 0.1 percent), the annual growth rate of GDP was 8.1 percent and 3.1 percent respectively. This ignited the discussion on "jobless growth".

[9] The two episodes of decrease in employment were mainly due to sharp decreases in the number of self-employed: 537 thousand (7.3 percent) in 1984 and 252 thousand (3.2 percent) in 2003. In those years, wage employment increased by 461 thousand (6.4 percent) and 222 thousand (1.6 percent). The recent discussion on the pessimistic labour market performance in terms of sheer quantity of employment might be too early to be accepted.

[10] It suggests that in 1996, the economy might have achieved nearly full employment.

[11] According to the report of population estimate by NSO, growth in population aged 15 and above is projected to decline further from 1.1 percent in 2007 to 0.8 percent in 2012.

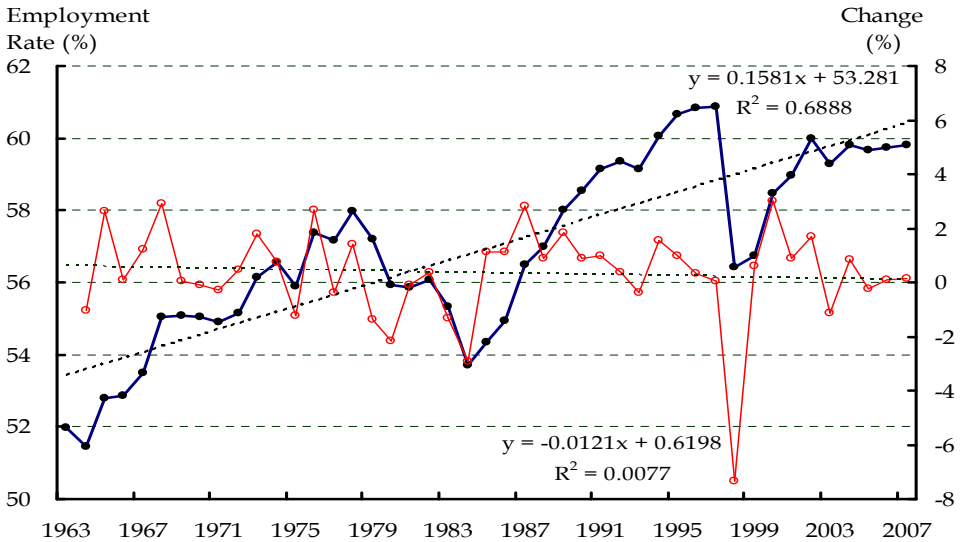
Note:
Emp = total employed
UE = unemployed
WAP = working age population aged 15 and above
EPR = the employment-to-population ratio, defined as the ratio of the number of workers to the number of WAP
WageEmp = the number of workers in wage or salaried employment
SelfEmp = the number of workers who are self-employed
% Self = the proportion of the self-employed in all workers
EPR 1 and 2 = the employment-to-population for: wage/salaried employment (1) and the self-employed (2) to WAP.
Source: NSO, KOSIS.

The employment growth rate fluctuated over the sub-periods, with an overall decline in the whole period. In the immediate aftermath of the 1997 financial crisis, growth rate in wage employment (column 3 in table 1) declined dramatically from 4 percent between 1988 and 1996 to just over 1 percent between 1996 and 2002, and only 1.3 million jobs were generated. At the same time, compared to the previous sub-period, the number of self-employed grew at a slightly higher rate of just above 0.7 percent between 1996 and 2002. During the same period, unemployment grew at a rate above 7 percent. Much of the wage employees who were laid off became unemployed and some were absorbed into self-employment. Furthermore, new entrants during the crisis period faced considerably lower probability of becoming employed, and many had little option but to stay out of the labour market or to join the labour force as unemployed.

2.1.2 The long cycle in employment-to-population ratio

The employment-to-population ratio, defined as the ratio of workers to the working age population aged 15 and above, rose from 52.0 percent in 1963 to 59.8 percent in 2007 (figure 2). The employment-to-population ratio captures an amalgamated effect of employment opportunities available, supply of labour, access to further education and training, and inactivity as result of social norm or discouragement. There have been three long cycles of employment-to-population ratio: 1963-1984, which peaked at 58.0 percent in 1978; 1984-1998, peaking at 60.9 percent in 1997 followed by a sudden large drop to 56.4 percent in 1998; and 1998-2007. The foreign exchange crisis pushed down the employment-to-population ratio by 4.5 percentage points, and it had not yet recovered to its pre-crisis level, staggering below 60.0 percent.

Figure 2 Trend in employment-to-population ratio

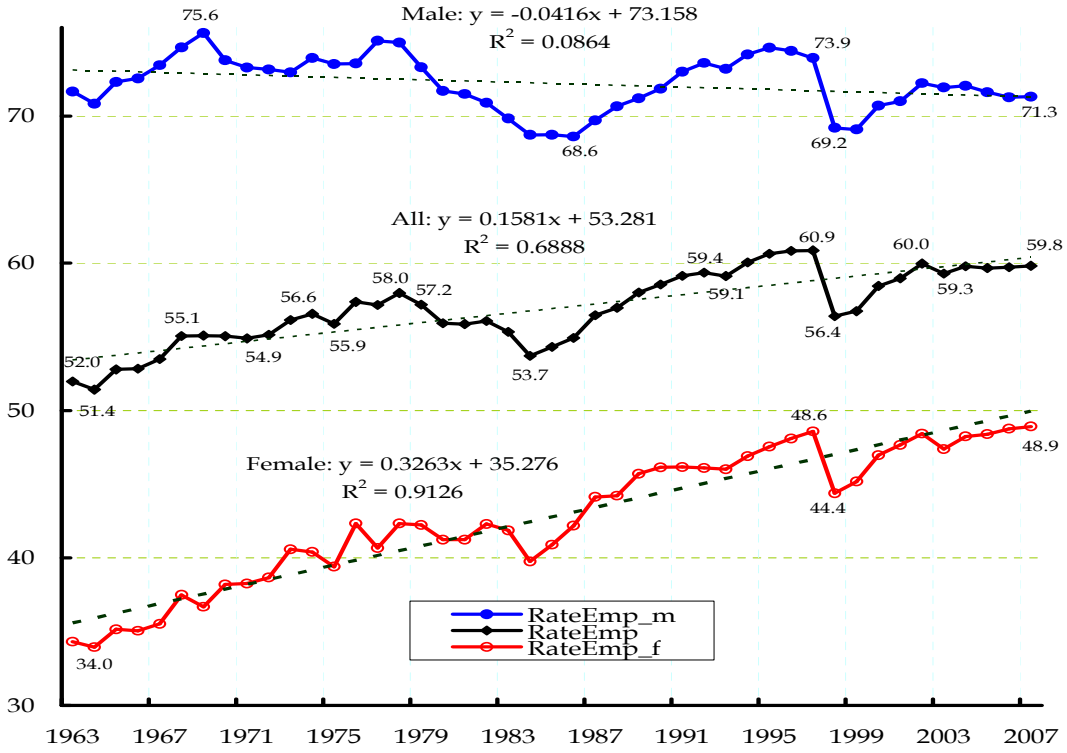


The average annual growth in employment-to-population ratio in shorter sub-periods in table 1 shows that negative growth in employment-to-population ratios were observed during 1979-1988, 1996-2002 and 2002-2007. In the sub-period that includes the crisis years, its annual decline was driven by a fall in both wage and self-employment. In the most recent sub-period, growth in employment-to-population ratio had been slightly negative. Decomposing into wage and self-employment shows that the decline was driven by a fall in self-employment (-1.4 percent). Such trend suggests that those who could not maintain their livelihood as self-employed either dropped out of the labour force or became unemployed. The movement out of self-employment into wage or salaried employment had not been sufficient to ensure workers' productive engagement in the labour market.

2.1.3 Employment-to-population ratio by demographic groups

The employment-to-population ratio of men was considerably higher than women's, and it remained high, mostly above 70 percent but decreasing slightly over the years by an annual average of 0.04 percentage point (figure 3). The employment-to-population ratio of women started from a low of 34.0 percent in 1963 and steadily rose by around 0.3 percentage point per year to reach 48.9 percent by 2007.

Figure 3 Trend in employment-to-population ratio by sex, 1963-2007 (%)



To investigate the sources of differences in employment-to-population ratio trends between men and women, the trends were decomposed by age groups and educational levels for a shorter time span of 1980 to 2007 (figures 4 and 5). The slight decline in employment-to-population ratio for men can mainly be attributed to its decline for youth between the age of 15 and 24, which was large enough to offset a slightly increasing employment-to-population ratio for older men aged 60 and above (figure 4a). In terms of education, the overall trend in employment-to-population ratio can also be attributed to the decline in the ratio for the less educated and a slight decline for the highly educated, while there was no observable time trend for that of the high-school graduates (figure 5a). Even though no definitive conclusions can be drawn without separately examining the trend in

working age population, the trends suggest that more young men who had thus far achieved less than high school education may be continuing or re-entering education. At the same time, those who had less than a high-school certificate faced higher chances of being out of jobs.

Figure 4a Trend in male employment-to-population ratio by age groups, 1980-2007 (%)

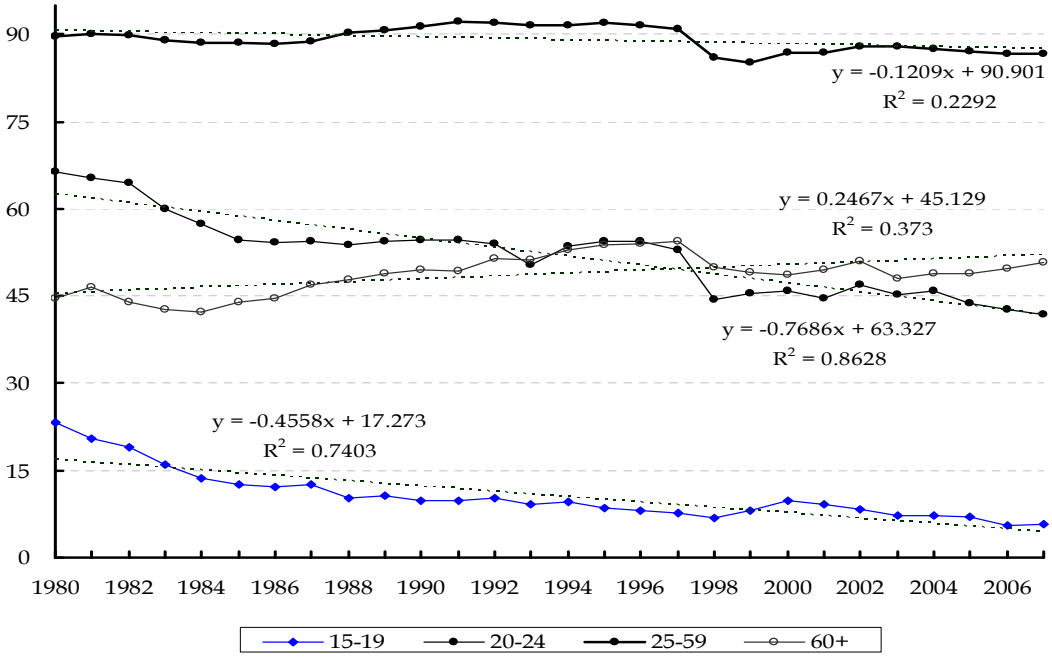
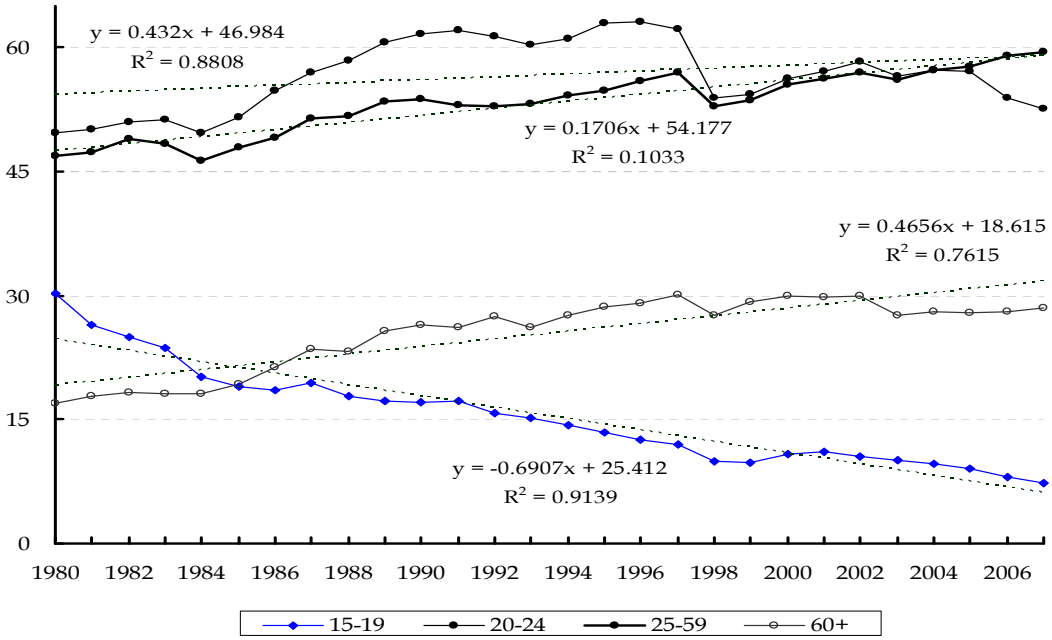


Figure 4b Trend in female employment-to-population ratio by age groups, 1980-2007 (%)



The significantly increasing trend for women's employment-to-population ratio was mainly due to increase in the ratio for those aged 20 and above (figure 4b). The employment-to-population ratio of the youngest cohort aged 15 to 19 declined steadily. In terms of education, the employment-to-population ratio for those with less than high-school certificate declined by 1.1 percentage point per decade (figure 5b). Most noticeable increase in the ratio took place for the highly educated women at 7.8 percentage points per decade,

and a slightly lower increase for high-school graduates at 4.9 percentage points per decade. For women, attaining education beyond high school acted as a catalyst for greater participation in the labour market.

Figure 5a Trend in male employment-to-population ratio by education, 1980-2007 (%)

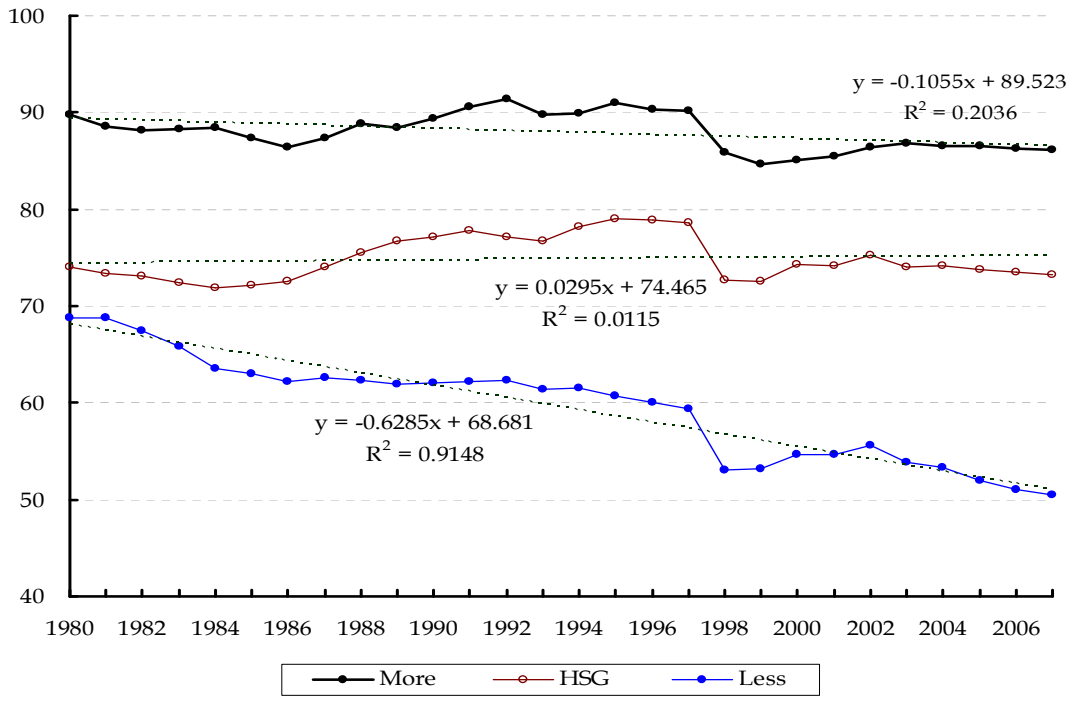
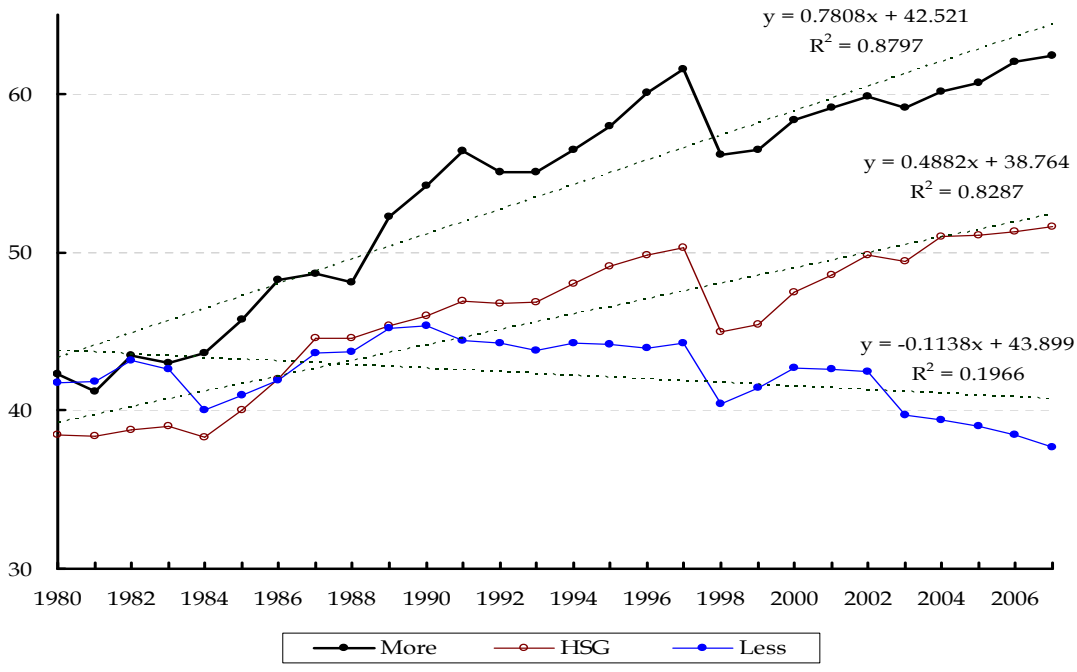


Figure 5b Trend in female employment-to-population ratio by education, 1980-2007 (%)



2.1.4 *Trend analysis of employment and employment-to-population ratio*

In addition to the graphical presentations of movements in total employment and employment-to-population ratios, a trend analysis incorporating business cycle indicator (BC) is briefly presented here. The business cycle indicator is a cyclical component of the coincident composite index.[12][13] Estimated trend for total employment is presented in table 2 and trend for employment-to-population ratio is presented in table 3.

Table 2 Trend analysis of total employment, 1970-2007

Dependent variable: Number employed	Trend			BC			Adjusted R^2
(1) Level	382.46	(7.11)	***	98.07	(38.25)	**	0.987
(2) Log level	0.024	(0.0001)	***	0.005	(0.004)		0.966
(3) Growth rate	-0.082	(0.028)	*	0.316	(0.148)	**	0.236

Note: Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100). Constant term was also included, but not presented in the table.

According to the estimates, employment increased by around 382 thousand per year, and its average annual growth rate was about 2.4 percent. The business cycle has positive effects on employment prospects, both in terms of its absolute level and growth, but no significant effect on the log level of employment. In the boom years, employment tends to grow at an accelerated pace, and in downturns, its growth decelerates. Other than fluctuations around the business cycles, annual employment growth rate decreased by 0.08 percentage point every year.

Trend analysis of employment-to-population ratio shows two notable features (table 3). One is that the employment-to-population ratio, in all its functional forms, was significantly and positively associated with the business cycle. For example, if the business cycle indicator goes up by 1 point, the rate goes up by 0.3 percentage points or by 0.5 percent. Secondly, time trend effect was significant only for the levels of employment-to-population ratios and not its growth. Because population growth is more likely to be exogenously determined, the trend analysis indicates that the supply behaviour of labour also responds to the ups and downs in the economic climate.

[12] The indicator, which is calculated and reported by the NSO, is a monthly time-series and its base year is 2005. In this study, the original time-series are converted to a yearly time-series by averaging its value over twelve months each year.

[13] The coincident composite indexes reflect current business conditions, consisting of seven indicators: industrial (manufacturing and mining) production index, industrial production index in the service industry except for wholesale and retail trade, manufacturing average operation ratio, consumer goods trade index, number of employees in non-farming households, import in constant prices, and construction order in real terms.

Table 3 Trend analysis of employment-to-population ratio, 1970-2007

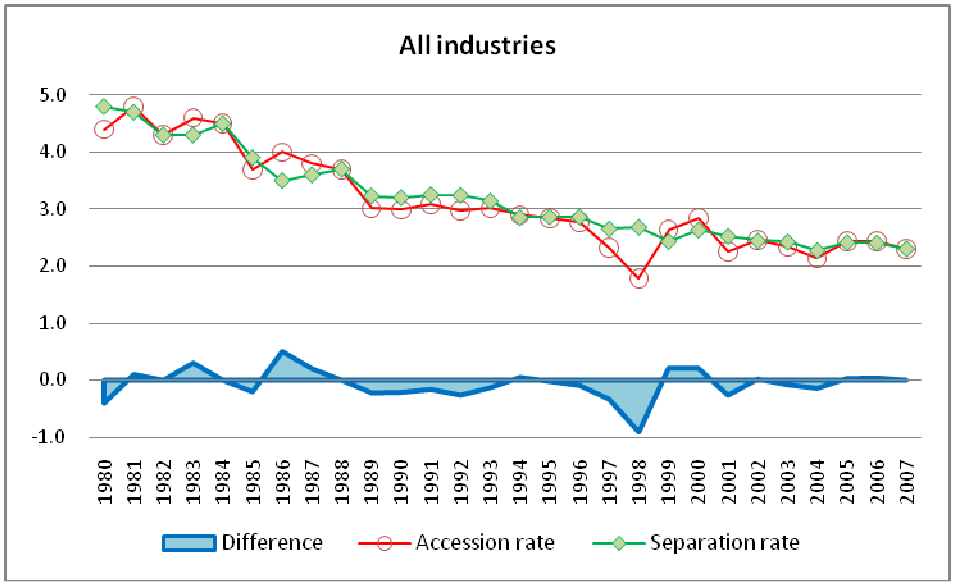
Dependent variable: Employment-to-population ratio	Trend			BC			Adjusted R^2
(1) Level	0.136	(0.019)	***	0.302	(0.102)	***	0.600
(2) Log level	0.002	(0.0003)	***	0.302	(0.002)	***	0.594
(3) Growth rate	-0.001	(0.027)		0.005	(0.005)	**	0.066

Note: Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100). Constant term was also included, but not presented in the table.

2.1.5 Declining employment accession and separation rate

Over time, job turnover rate has been declining in Korea. In non-agricultural establishments that employed more than ten employees, both employment accession and separation rates had followed a downward trend since 1980. Labour market in such establishments has grown more stable, with decreasing movement of workers into and out of jobs. During the crisis years of 1997 and 1998, much of the fall in employment originated from a sudden lack of access to jobs, in relation to a fairly steady and slowly declining separation rate. It means that those who had already been unemployed or who were just about to enter the labour market suddenly faced a narrow window of employment opportunities. On the surface, employment accession did not pick up sufficiently in the 2000s to compensate for the large fall in accession rate in 1998. Much of this fall in accession and separation patterns of jobs were driven by shortfalls in accession rate vis-à-vis employment separation in sectors such as *wholesale, retail, restaurants and hotels* and *transport, storage and communications*. The manufacturing sector had undertaken some labour shedding in the 1990s already, and job turnover was relatively small following the drop in accession rate in 1997 and 1998.

Figure 6 Employment accession and separation rate, 1980-2007



Source: Ministry of Labour, Report on Monthly Labor Survey. Establishments employing more than 10 employees are covered.

2.2 Wage/Salaried employment vs. self-employment

There has been a slowdown in employment increases in the recent decade, at a rate below the increase in working age population. But increase in total employment per se does not give the full picture of the shifts in labour market situation since the foreign exchange crisis in late 1997. One of the concerns in the 2000s has been an increase in the share of "non-regular" forms of employment, with limited contractual duration, lower pay, limited entitlements, and possibly a limited access to formal social safety nets, in spite of the well-intended efforts by the government to extend the coverage of employment insurance system. In 2004, the employment insurance system has been extended to non-regular workers, such as daily workers and part-time workers working more than 15 hours per week (or 60 hours per month). In addition, construction sector has been subject to employment insurance when the total amount of construction is 20 million KRW and more. As a result, non-regular workers can be entitled to not only unemployment benefits but also Employment Security and Vocational Skills Development program.

There are various arguments about why non-regular types of employment had increased. One of the identified reasons is that enterprises under intense competitive pressure of the globalized market and rapid technological changes need to hire low-cost labour and to manage workforce flexibly to be able to survive. Employment protection legislation of regular workers remains too strict while that of non-regular segments of the workforce had been de-regularized, and employing non-regular workers is increasingly becoming a means of adjusting to competitive pressures. While the government had been committed to extend the income protection and support to such non-regular workers, the actual outreach of such desirable policy efforts need to be more carefully examined. At the same time, redressing the unbalance between protection and flexibility in hiring and dismissal of regular and non-regular workforce would be needed.

In the current and the subsequent sections, a detailed refinement to identify non-regular versus regular work, which pertain to wage or salaried employment, is not attempted, but some discussions are provided around the trend analysis of wage emplyometn and self-emplyoment. The self-employed, particularly contributing family workers and own-account workers, have been idnetified as a group of "vulnerable" workers. The current examination merely provides some background information to examine aspects of workers' vulnerability in the labour market.

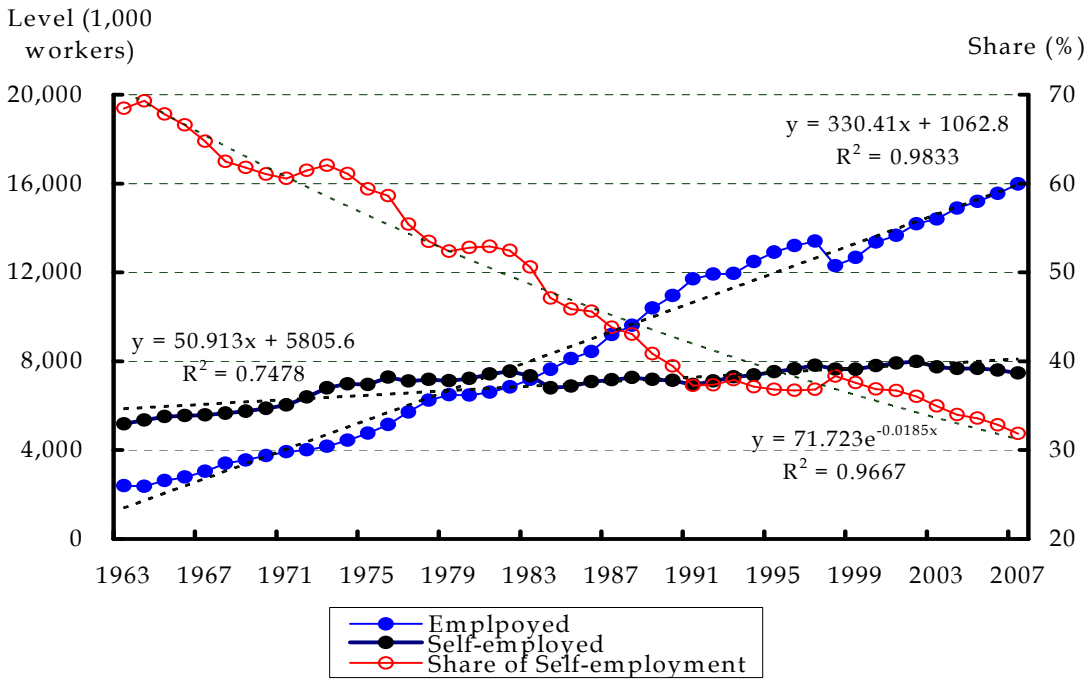
2.2.1 Significantly different trends in wage/salaried employment and self-employment[14]

The share of self-employment in total employment declined steadily, reflecting a move towards a salaried labour market in the last four and half decades (figure 6). However, the share remained quite high, at above 30 percent in 2007, while the OECD average of this share lies below 20 percent. Since 1963, the number of wage or salaried employees increased at a much faster rate than for the self-employed. The number of workers in wage employment in 2007 (16 million) was 6.7 times its level in 1963 (2.4

[14] In the NSO's monthly Economically Active Population Survey (EAPS), workers are classified into the wage or salaried employees and the self-employed. Those in wage or salaried employment are further classified into permanent workers, temporary workers, and daily workers. The self-employed are classified further into employers, own-account workers, and unpaid family workers. The term "wage or salaried employment" is interchangeably used with "wage employment", mainly for convenience.

million). For the self-employed, their number in 2007 was only 1.5 times their 1963 level. As a result, the share of self-employment in total employment became less than a third in 2007, compared to about 70 percent in 1963.

Figure 7 Trend in wage employment and self-employment

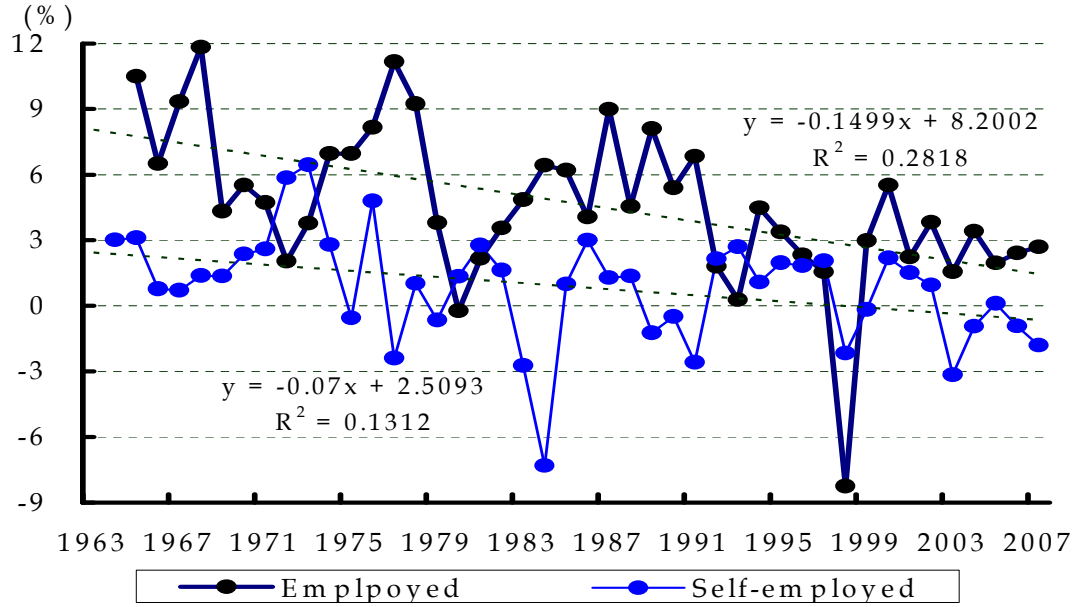


In terms of growth rates, however, both wage and self-employment had declining growth rates. The decline was more marked for wage or salaried employment than for self-employment: it fell by 0.15 percentage point per year for wage or salaried employment and 0.07 percentage points for self-employment. For the wage employed, there were only two incidences of negative growth in 1980 and 1998, and it grew at a positive rate in the 2000s. For the self-employed, however, incidences of negative annual growth rate had been numerous[15], and after 1999, its trend growth became negative. In the 2000s, just after three years of experiencing fairly high growth rate (2000-2002), self-employment decreased consecutively in the recent five years (2003-2007).[16]

[15] The highest annual growth rate of self-employment was 7.3 percent in 1984.

[16] Many studies have argued that there had been a restructuring of self-employed, since it over-expanded after the 1997 foreign exchange crisis, partly in response to government efforts to mitigate unemployment and partly as remaining means of sustaining livelihood for those who were laid off or entering the labour market for the first time.

Figure 8 **Trend in growth rate of wage/salaried employment and self-employment**



2.2.2 *Trend analysis of wage employment and self-employment*

The same trend analysis as one conducted for total employment and employment-to-population ratio was conducted for wage or salaried employment and self-employment. The coefficients on *Trend* and *BC* are statistically significant in general, except for the coefficient on *BC* for log of wage employment. The business cycle had positive effects on the number in wage employment, as well as its growth rate. According to the estimates, between 1970 and 2007, the numbers of workers in wage employment increased by 349 thousand per year, and its average annual growth rate was about 4.0 percent. Row (3) in table 4 confirms the declining trend in the growth rate of wage employment, after controlling for business cycle effects, and it decreased by 0.12 percentage point per year.

Table 4 **Trend analysis of wage employment, 1970-2007**

Dependent variable: Wage or salaried employees	Trend			BC			Adjusted R^2
(1) Level	348.91	(7.61)	***	79.78	(40.95)	*	0.983
(2) Log level	0.040	(0.002)	***	0.005	(0.008)		0.950
(3) Growth rate	-0.126	(0.046)	***	0.446	(0.241)	*	0.203

Note: Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100). Constant term was also included, but not presented in the table.

The same analysis for the self-employed shows that self-employment was less likely to be affected by cyclical fluctuations. This could mean that the reasons for becoming self-employed were not driven by the ups and downs in the economy. It could also mean that those who became self-employed did not have many other alternatives to sustain their livelihood. People were less likely to participate in the labour market as self-employed for positive reasons such as perceived economic opportunities that could be fruitfully exploited. According to the estimates in table 5, the number of self-employed increased by

around 33 thousand every year, and its average annual growth rate was 0.5 percent. Growth in self-employment was also negative, decreasing by 0.08 percentage point per year.

Table 5 Trend analysis of self-employment, 1970-2007

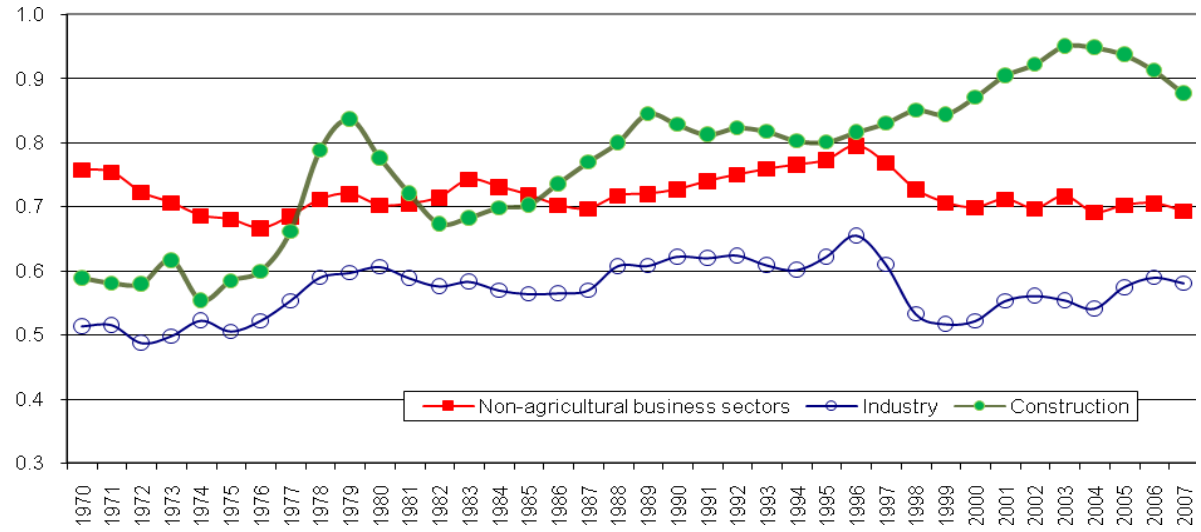
Dependent variable: Self-employed	Trend			BC		Adjusted R^2
(1) Level	33.50	(4.34)	***	18.25	(22.37)	0.609
(2) Log level	0.005	(0.001)	***	0.002	(0.003)	0.590
(3) Growth rate	-0.082	(0.039)	**	0.105	(0.206)	0.067

Note: Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100). Constant term was also included, but not presented in the table.

2.3 Earnings and its distribution[17]

The above subsections demonstrated that the prospects for accessing employment have been narrowing over time. This subsection explores the consequences in terms of labour share in income that slower employment growth may cause. According to the OECD data, the labour income share in non-agricultural business sectors was on a gradual increase since 1986, peaking in 1996 at 80 percent. After the 1997 crisis, however, this share declined and has thus far not shown any clear trend in the 2000s. It hovered around 70 percent of total income in non-agricultural sectors. 1997 marked a turning point in the trend of factor income shares. Because labour compensation includes imputed compensation values for the self-employed, it shows that after the 1997 crisis, self-employment, together with slower increase in employment have constrained workers' share in total value added.

Figure 9 Labour income share (real unit labour cost) by selected sectors, 1970-2007



Source: OECD.stat, data extracted on 29 September 2009 10:26 (GMT).

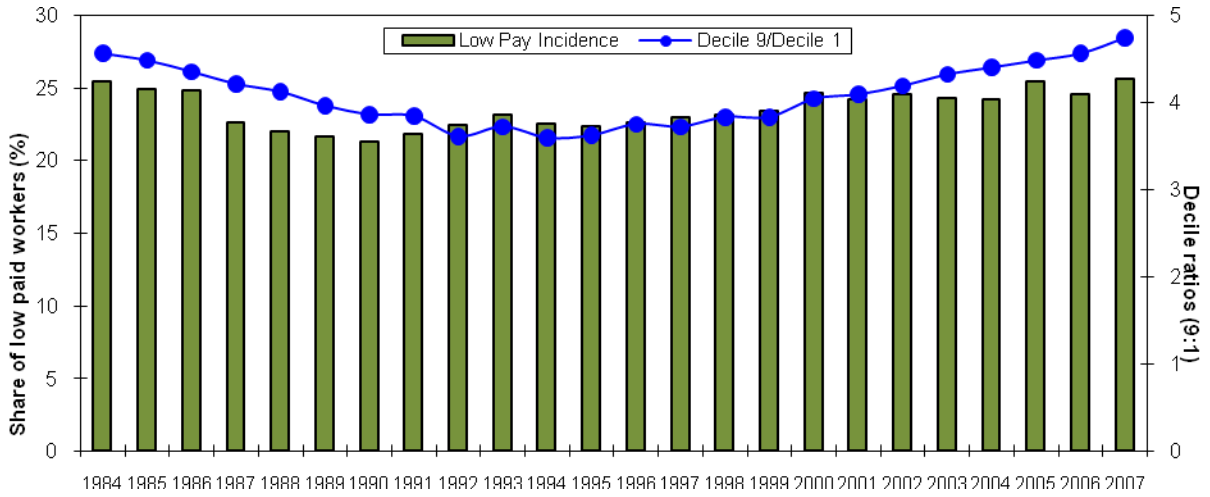
[17] This subsection uses OECD data as a main source.

By selected sectors (construction and industry), the labour income share also partially captures the labour-intensity of the different sectors. It shows that the construction sector had increasingly become labour intensive, and the labour share in valued added peaked at about 95 percent in 2003. Since then, labour share has declined. In industry, including manufacturing, labour income share declined significantly after 1996. It bottomed out at just above 52 percent in 1999, before recovering gradually to 58 percent in 2007. However, this share was still below the average labour share of 61 percent during the decade before 1997. This decline can be partly capturing the effect of shift in manufacturing industry from labour-intensive to capital-intensive production.

2.3.1 Increasing earnings disparity

Lower labour income share in non-agricultural sectors can also be capturing the growing division in the labour force between the top and the bottom earners. While the magnitude of incidence may differ, depending on the data sources and the degree of refinement in the definition, there seems to be a consensus that increasing incidence of non-regular work has been taking place since the 1997/8 crisis (Grubb et al., 2007). And non-regular workers tend to earn less, have access to less entitlement, and face limited contractual terms and duration. As can be seen from figure 8, the share of low paid workers (less than two-third of median earnings) had flattened at about 22 percent in the early 1990s, before showing an increasing trend after 1998. More clearly, the ratio between the 9th decile and the 1st decile earnings has been on the rise since the late 1990s.

Figure 10 Low pay incidence and decile ratios, 1984-2007



Source: OECD.stat, data extracted on 29 September 2009 10:26 (GMT). 1984 was the earliest data point available.

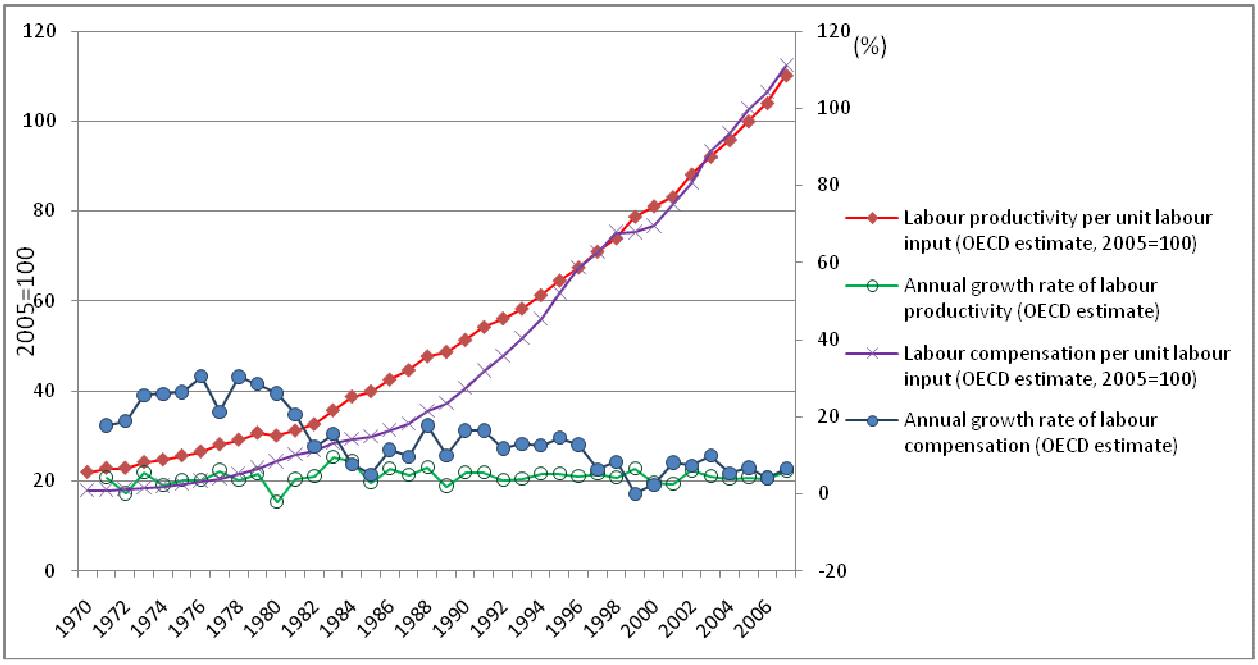
According to KLI's 2002 Workplace Panel Survey, the most frequently cited reasons for hiring non-regular workers had been to reduce labour costs and to have more flexibility in employment (Ahn, 2004). Reduction in labour costs was more frequently cited among small and medium enterprises, while flexible workforce was more important for large enterprises. Such increase in non-regular employment was partially the outcome of concentrated deregulation of employment protection legislation (EPL) for temporary forms of employment, while leaving EPL for regular employment largely unchanged. Hence, not only has there been decreasing access to employment, but such decrease may have been more pronounced for regular forms of employment. This is a call for concern in the current global downturn, as the increasing number of non-regular employees is the first likely candidate to suffer job losses, and in spite of considerable improvements in provisions for outreach, the actual employment insurance coverage may still be limited. For example, in 1998, number of workers insured in establishments which applied for employment insurance stood at approximately 26 percent of total employment. This share increased to

37 percent by 2007.[18] However, coverage of establishments may not be complete, and the number of workers insured still remains low. Furthermore, the current downturn may create pressures for further non-regularization of employment, as enterprises try to cut costs for survival.

2.3.2 *Unit labour productivity outweighed labour compensation throughout the period*

According to the OECD data, standardized labour productivity level tended to outweigh labour compensation between 1970 and 2007. The gap between productivity and compensation narrowed considerably in the 1990s, reaching near convergence by 1998. However, such trend was temporarily reversed in the subsequent four years. After 2005, the index year used, labour compensation per unit of labour input became higher than productivity index. In terms of growth rates, labour compensation grew in 1998, partially capturing the extent of dismissal and sustenance of pay for those who remained employed in the immediate aftermath of the exchange rate shock. However, growth rate of compensation per unit of labour input dropped in 1999 to 0.1 percent. Drop in labour productivity growth rate took place in the subsequent years of 2000 and 2001: 3.0 percent in 2000 and 2.5 percent in 2001. Since then, according to the data, growth in compensation outweighed growth in labour productivity.

Figure 11 Labour productivity and compensation, 1970-2007



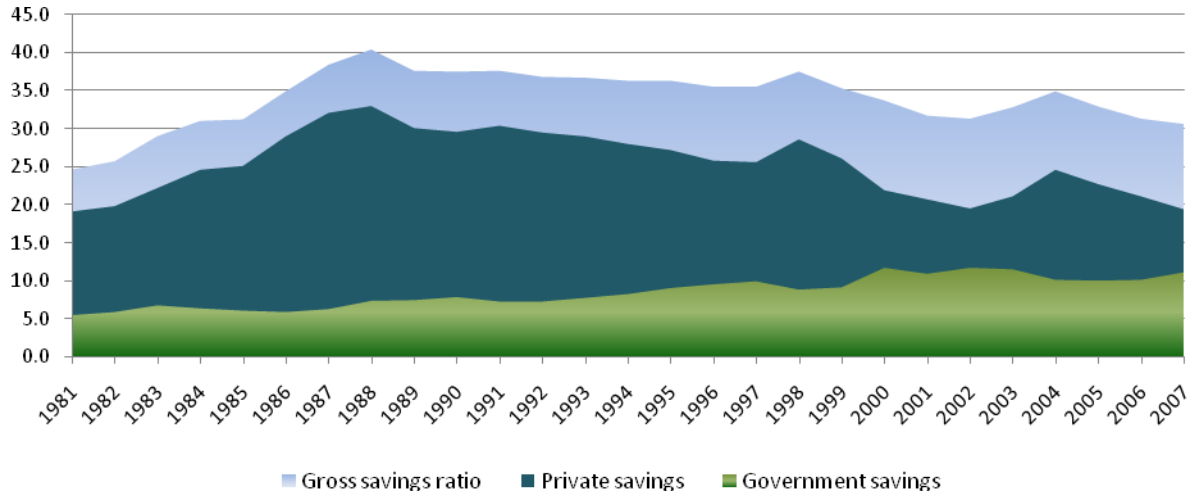
Source: OECD.stat, data extracted on 10 Nov 2009 15:48 UTC (GMT).

[18] Estimated from Human Resources Development Service of Korea, "Yearly Statistics of Employment Insurance". This calculation is very rough and preliminary, and needs further detailed validation.

2.4 Savings

Growing earnings inequality and uncertainty of earnings prospects would be reflected on the amount of savings the households and enterprises are capable of undertaking, and hence upon resources available for investment. The gross savings ratio shows a consistent decline in private savings, and the declining share of private savings became more marked after 1998, which declined by 10 percentage points after peaking at 29 percent in 1998. (See figure 11.) In accordance, the government's share in gross savings increased, from 6 percent in 1981 to 11 percent in 2007.

Figure 11 Gross saving ratio, 1981-2007



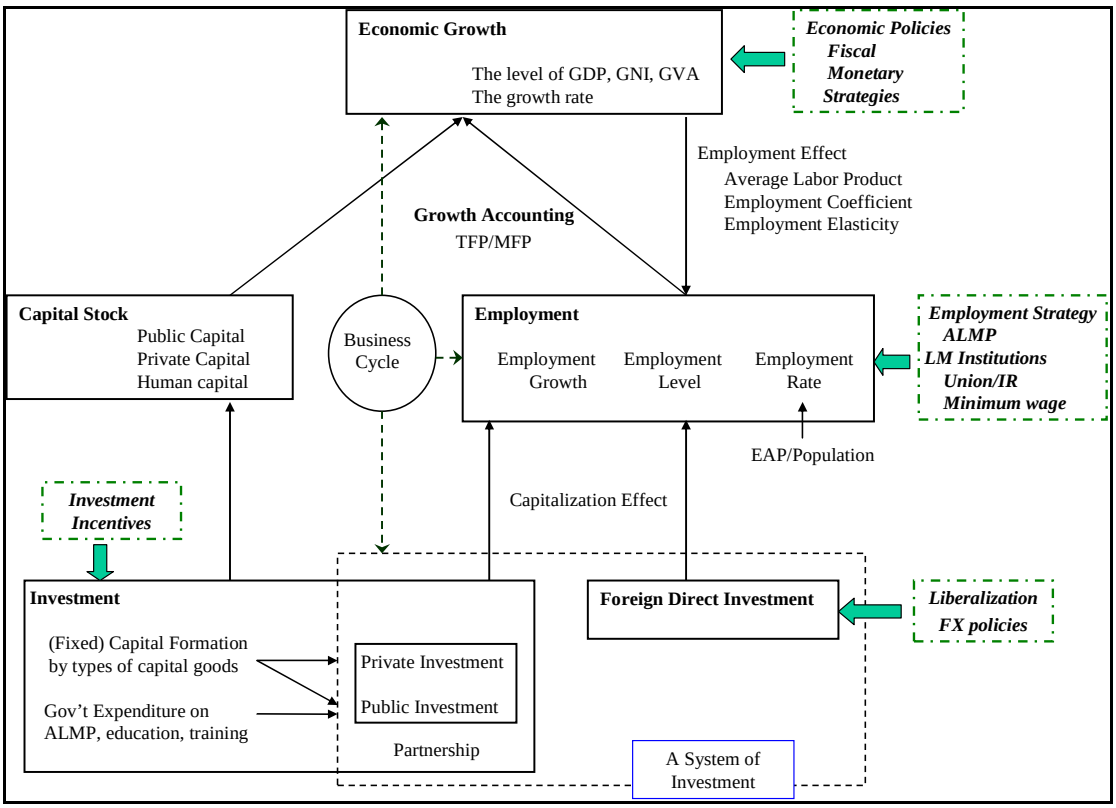
Source: The Bank of Korea, Economic Statistics System (ecos.bok.or.kr).

If a large majority of households were earning less, it contributes to decline in household savings. Also, if a substantial share of establishments consisted of small and medium sized establishments, their ability to generate savings to cover for future risks and to invest further in their businesses were also constrained.

3. The conceptual framework for investment, growth and employment

The conceptual framework to capture the relationship between investment, capital growth and employment can be illustrated in Box 1. The aggregate output (Y) is produced using physical capital (K) and human capital (H) via aggregate production function F(K, L; A). A reflects the state of technology. Contribution of each input can be calculated by estimating the aggregate production function, and it results in a growth accounting exercise. The physical capital stock at a point in time is determined by the marginal product of labour, which is affected by the total factor productivity that reflects efficiency in the aggregate production function. Employment outcomes are affected by a feedback effect of economic growth, by domestic and foreign investment, and the employment rate is also affected by the growth rate of working age population.

Box 1 The conceptual framework

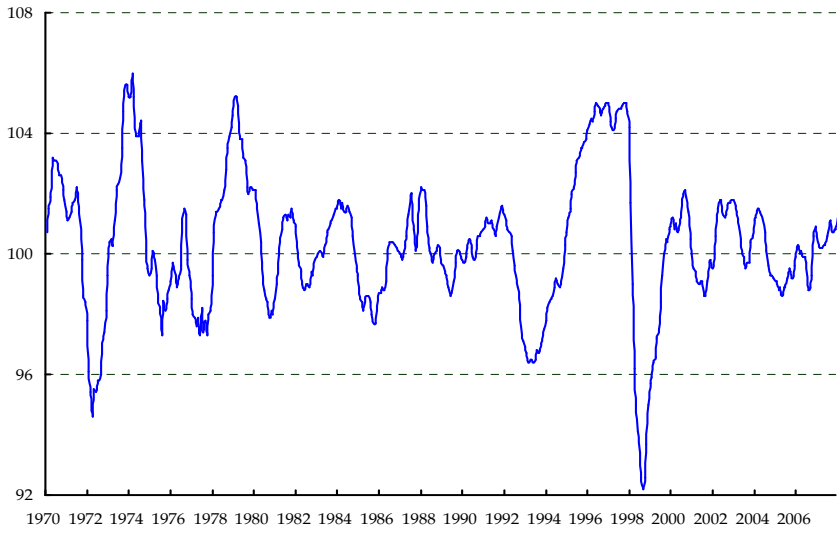


Note: The price variables in the markets for product, capital and labour are dropped in the diagramme.

The empirical focus of this study is 1970-2007 and the overall period can be divided into five sub-periods according to the business cycle:

1970-1979: the peak of the second business cycle
1979-1988: the peak of the fourth business cycle
1988-1996: the peak of the sixth business cycle
1996-2002: the peak of the eigth business cycle
2002-2007: the progress of the eighth business cycle

Figure 12 The business cycle (2005 = 100)



Note: The cyclical component of the coincident composite index.
Source: NSO.

3.1 Employment

The human capital stock in effective unit that takes into account of the quality of workers can be expressed as $H = q \times L \times T$, where L is the number of workers, T is the number of hours worked, q is the quality of workers, and $L \times T$ is the effective labour.[19] The number of workers is the simplest approximation of human capital.[20] Workers can be further classified into wage or salaried employment and self-employment according to their employment status[21] and as skilled or unskilled workers. No further disaggregation into regular and non-regular forms of employment were attempted in the subsequent empirical section due to the entailing complexity of the analysis, but some implications are drawn from the observed relationship between growth in employment, output and investment.

The previous section conducted a long-term descriptive analysis of employment and other labour market indicators, between 1963 and 2007, 1970 and 2007, and 1980s to 2007, depending on the data sources and availability of the data. The empirical section places exclusive focus on the macroeconomic relationship between the aggregate variables consisting of employment, output, investment and foreign direct investment (FDI). While such exclusive focus on these macroeconomic variables may miss out more than it explains, we nonetheless aim to highlight and clarify their relationships to each other. This would give some gauge as to how other fundamental factors that drive economic growth and labour market outcomes, such as domestic and external economic institutions and policies and labour market institutions and policies, would explain insufficiency in aggregate employment growth.

The methods of analysis used are: dynamic analysis using polynomial distributed lags (PDLREG) and vector autorgressive processes (VAR). Because macroeconomic variables have both contemporaneous and long-lasting effects on each other, their effects are better captured by using lagged values. Imposing a particular functional form on lag structures allow for efficient estimation of the coefficients. VAR is also used in the empirical section since it is a convenient macroeconometric tool to treat multiple endogenous variables. For example, output growth and employment growth clearly affects each other, and the direction of causality is *ex ante* bi-directional. If aggregate output grows, firms may anticipate better economic climate in the near future and start hiring to increase production. Also, because employment is part of the aggregate production function, employment growth clearly raises output. In a similar manner, the relationships between aggregate output and investment as well as between investment and employment can be interdependent.

3.2 The aggregate output

The long-term trend in aggregate output and its relationship to employment are analyzed in section 4.1. Gross domestic product at market prices (GDP), gross national income (GNI) and gross value added at the basic prices (GDPind) in the National Accounts represent the aggregate output. A trend analysis of aggregate output between 1970 and

[19] The 'human capital indicator' can be calculated and used as a proxy for the quantity of labour. The indicator should reflect the human capital accumulation process, which takes into account investment in education, learning-by-doing or work experience, on-the-job or off-the-job training and its depreciation due to obsolescence or being out of the labour force.

[20] In this study, the number of workers is used to represent employment.

[21] The EAPS by the NSO classifies workers into permanent workers, temporary workers, daily workers, the employer, own-account workers, and unpaid family workers. Wage or salaried workers consist of the first three types of workers, and self-employment consists of the last three.

2007 is followed by an analysis of some well-known relationship between GDP and employment: the average labour product (ALP), the employment coefficient (EC) that represents labour requirement for producing a unit of output (1 billion KRW of GDP), and the employment elasticity (EE) defined as the ratio of employment growth to output growth.

3.3 Investment

The National Accounts reports gross fixed capital formation between 1970 and 2007[22], which is gross capital formation minus changes in inventories. It also reports gross fixed capital formation by types of capital. For example, construction investment is the sum of residential building, non-residential buildings, and other construction; facilities investment is the sum of transport equipment and machinery equipment; and intangible fixed assets. The gross fixed capital formation is also decomposed by economic activity or industries.[23]

In this study, it was necessary to re-categorize various types of fixed capital formation into private and public investment. One of the simplest ways would be to regard investment in construction as public investment and to group facilities and intangible assets as private investment. A broader concept of public investment can be defined as the sum of public investment (construction) and government final expenditure on education and labour market policies.[24] However, such broader categorization was beyond the scope of this paper.

The first part of section 4.2 analyzes a long-term trend in investment in total and by types. Relationships between various types of investment are examined by VAR. A Granger causality test[25] is conducted to check whether each types of investment is statistically exogenous, such that each series is generated by an independent process. There are some reasons for suspecting inter-dependence across different types of investment in the context of industrial zone development, for instance. The government may initiate construction works to network newly identified industrial zone for further development. The enterprises who settle into the zones would invest further in machinery and equipments. Hence, two investment types are inter-dependent. Indeed, existence of such inter-linkages over time would be one of the features of "successful" investment projects. In statistical terms, the construction investment is interpreted to be generated by an independent process if the current and past levels of facilities investment do not provide any additional information about the conditional mean of current construction investment, once the past values of construction investment had been accounted for. If the series are found to be dependent on each other, their relationships as substitutes or complements are examined. The third part of the section investigates the capitalization effect.

[22] They are readily available on the website of the Bank of Korea.

[23] They are (1) agriculture, forestry and fishing, (2) mining and quarrying, (3) manufacturing, (4) electricity, gas and water supply, (5) construction, (6) wholesale and retail trade, restaurants and hotels, (7) transport, storage and communication, (8) financial intermediation, (9) real estate, renting and business activities, (10) public administration and defense, compulsory social security, (11) education, (12) health and social services, and (13) other service activities.

[24] The government final consumption expenditures consist of (1) general public services, (2) defense, (3) public order and safety, (4) economic affairs, (5) environmental protection, (6) housing and community amenities, (7) health, (8) recreation, culture and religion, (9) education, and (10) social protection. Such information is available on the website of the Bank of Korea.

[25] Granger non-causality can be defined by the assumption $E[y_t|y_{t-1}, x_{t-1}, x_{t-2}, \ldots] = E[y_t|y_{t-1}]$.

3.4 Foreign direct investment

Foreign direct investment (FDI) has been perceived to add external boost to the economy. Its role can be summarized as capital formation effect, productivity effect by capital deepening and technology transfer, employment effect, trade effect, and competition effect.[26]

In the current analysis, the capitalization effect of FDI is first examined by estimating a lagged model. Subsequently, the relationships between different types of investment are examined, to understand the responsiveness of FDI to domestic investment processes. For instance, it is often noted that investment in infrastructure needs to take place first before foreign investors are attracted to the business opportunities in the country.

4. Empirical analysis of investment, growth and employment

4.1 Growth and employment

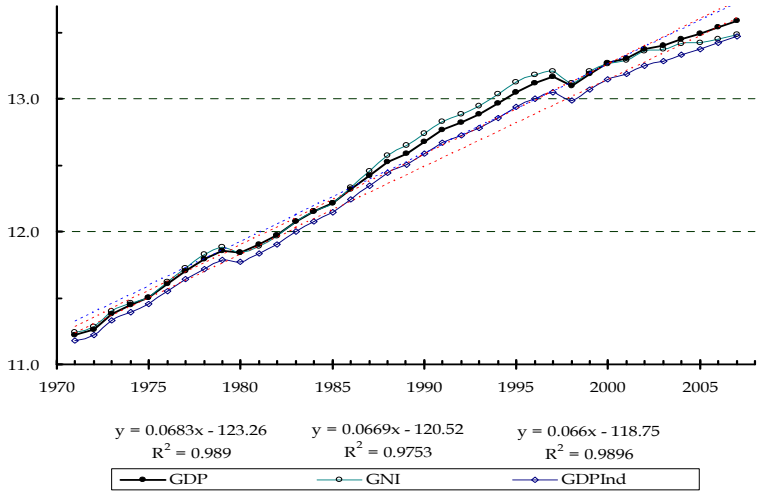
In spite of increasing concerns about "jobless growth", in general, economic growth should have positive employment effects. At the minimum, expectations about trend in economic growth generate feedback effects by inducing enterprises to invest and expand and to hire greater number of people. On the other hand, since economic growth is generated by factor accumulation and technological progress, there would be some persistence in the employment series. In terms of long/term relationships, if the rate at which the economy grew were to become highly volatile, growth may not feedback into a large employment effect. Furthermore, dismissal in times of downturns, narrowing window of access to regular jobs, worse working conditions in majority of jobs that dismissed workers would have immediate access to would serve to polarize the labour force in the longer-run. Increasing inequality in earnings, contracts, and working conditions can feedback into economic growth in terms of limited investment, particularly amongst the labour-intensive small and medium sized enterprises, and limit potential employment growth in the future. While no conclusive evidence would be presented here, this could have been part of the story after the 1997/8 foreign exchange shock in Korea, when employment growth slowed down to a rate below population growth rate. This calls for further concerns in the context of 2008 financial crisis, and the trend for increasing polarization could continue because medium and large enterprises may react by cutting down regular jobs within the coming few years, non-regular workers are dismissed first, and young graduates miss opportunities to access regular first jobs.

4.1.1 Long-term trend in growth

During the last four decades, the Korean economy grew at an average annual rate of 6.8 percent. Between 1970 and 2007, there were two episodes of negative growth in 1980 and 1998 (figure 13). The first episode can be mainly attributed to the 'second oil shock' and the second one to the foreign exchange crisis.

[26] Some important empirical studies on the role of FDI in Korea include Choi and Hyun (1991), Wang (1994), Kim (1997), Hong (1997), Kim and Hwang (1998), Hong (1998), Kim (1999), Yun and Lee (2001), Lee (2002), Yeon (2003), Kang and Suh (2005), Nam and Yun (2005), KDI (2006), Kang and Sohn (2007), Bank of Korea (2008.05), and Jung and Kim (2008).

Figure 13 Long-term trend in output (log level), 1970-2007



Note: GDP at market prices, GDPInd is gross value added at basic wholesale prices, and GNI is gross national income.

Decomposing the growth patterns into sub-periods (table 6), two observations stand out: growth rate declined and GNI grew at a lower rate than GDP or GDPInd. The GDP growth rate almost halved from 8.3 percent in the first sub-period (1970-1979) to 4.3 percent in the fourth sub-period (1996-2002) that included the foreign exchange crisis, before rebounding slightly to 4.4 percent in the last sub-period (2002-2007). Between 1970 and 2007, the growth rate of GDP fell by 0.1 percentage point every year (figure 14).

Table 6 Long-term trend in output, 1970-2007

Year/period	GDPInd	GDP	GNI
Level (billion KRW)			
1970	66,413	69,064	71,134
1979	131,372	140,996	144,933
1988	253,542	275,235	288,144
1996	442,956	499,790	529,707
1997	464,230	523,035	544,132
1998	437,654	487,184	499,004
2002	570,436	642,748	633,842
2007	709,827	798,057	720,705
Average annual growth rate (%)			
1970-07	6.6	6.8	6.5
1970-79	7.9	8.3	8.2
1979-88	7.6	7.7	7.9
1988-96	7.2	7.7	7.9
1996-02	4.3	4.3	3.0
2002-07	4.5	4.4	2.6

Note: All the values are in 2000 constant prices.

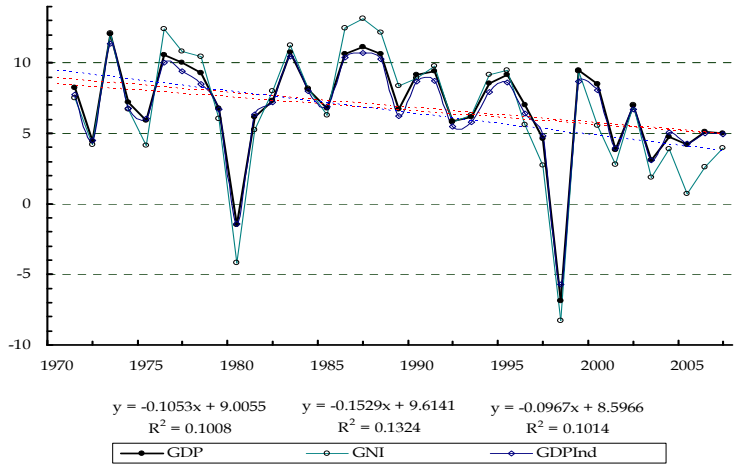
GDP = gross domestic product at market prices

GDPInd = gross value added at basic prices by industries

GNI = gross national income

Source: BOK, National Account.

Figure 14 Long-term trend in growth rate of output, 1970-2007 (%)



Over the whole period, the gaps between the growth rates of GNI and GDP or GNI and GDPInd were only 0.4 and 0.2 percentage points respectively. However, in the first sub-period, there were no such noticeable gaps, and the growth rate of GNI exceeded that of GDPInd. This pattern continued into the third sub-period (1988-1996). The pattern was reversed in the fourth sub-period when GNI grew at a lower rate than GDP or GDPInd by 1.3 percentage points. In the last sub-period, the gap grew bigger to almost 2 percentage points. Such gaps indicate large and growing losses in net factor income from the rest of the world, as well as gains and losses in trading as a result of changes in the terms of trade.

A trend analysis confirms the decline in economic growth rate. Growth rates declined significantly by 0.1 percentage point for GDP and GDPInd and by 0.2 percentage point for GNI every year. In general, the business cycle had a positive effect on growth and a significant effect on the growth rate. When the business cycle indicator increase by 1 point, the growth rate of aggregate output rises by 0.6 to 0.7 percentage points.

Table 7 Trend analysis of output, 1970-2007

Dependent variables:	Trend			BC			Adjusted R^2
GDP							
(1) Level	20,027	(730)	***	4,801	(3929)		0.953
(2) Log level	0.069	(0.001)	***	0.009	(0.006)		0.990
(3) Growth rate	-0.103	(0.049)	**	0.682	(0.257)	**	0.211
GDPInd							
(1) Level	17,599	(624)	***	3,828	(3358)		0.955
(2) Log level	0.066	(0.001)	***	0.008	(0.008)		0.990
(3) Growth rate	-0.095	(0.045)	**	0.612	(0.236)	**	0.206
GNI							
(1) Level	19,332	(613)	***	5,583	(3215)	*	0.966
(2) Log level	0.067	(0.002)	***	0.011	(0.009)		0.977
(3) Growth rate	-0.151	(0.064)	**	0.660	(0.333)	*	0.177

Note: Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100). Constant term was also included, but not presented in the table.

4.1.2 *Long-term relationships between growth and employment*

Some of the important indicators that reflect the relationship between output and employment are the average product of labour (output per worker), employment coefficient (the ratio of employment to output), and employment elasticity (the ratio of employment growth to output growth). The employment coefficient is defined as the number of workers required to produce one unit of GDP. Its trend reflects the state of macroeconomic production technology and its demand for workers to produce the same amount of GDP by treating all products uniformly.

Table 8 Long-term relationships between output and employment, 1970-2007

Year/ period	APL (million KRW)	Employment Coefficient	Employment Coefficient 1	Employment Coefficient 2	Employment elasticity	Employment elasticity 1	Employment elasticity 2
Level							
1970	7.18	139.28	54.25	85.04			
1979	10.37	96.47	45.95	50.53			
1988	16.32	61.29	34.92	26.38			
1996	23.97	41.72	26.41	15.31			
1997	24,66	40.56	25.63	14.93			
1998	24.43	40.93	25.24	15.68			
2002	28.99	34.49	22.06	12.43			
2007	34.06	29.36	20.01	9.35			
Average annual growth rate/change							
1970-07	4.30	-2.97	-0.93	-2.05	0.356	0.585	0.095
1970-79	4.17	-4.76	-0.92	-3.84	0.476	0.760	0.263
1979-88	5.17	-3.91	-1.23	-2.68	0.314	0.580	0.027
1988-96	4.92	-2.45	-1.06	-1.38	0.345	0.523	0.085
1996-02	3.22	-1.21	-0.72	-0.48	0.239	0.281	0.167
2002-07	3.22	-1.03	-0.41	-0.62	0.252	0.544	-0.305

Note:

APL = average product of labour = (GDP)/(number of workers)

Employment coefficient = (number of workers)/(1 billion KRW GDP)

Employment coefficient 1 = (number of wage employed)/(1 billion KRW GDP)

Employment coefficient 2 = (number of self-employed)/(1 billion KRW GDP)

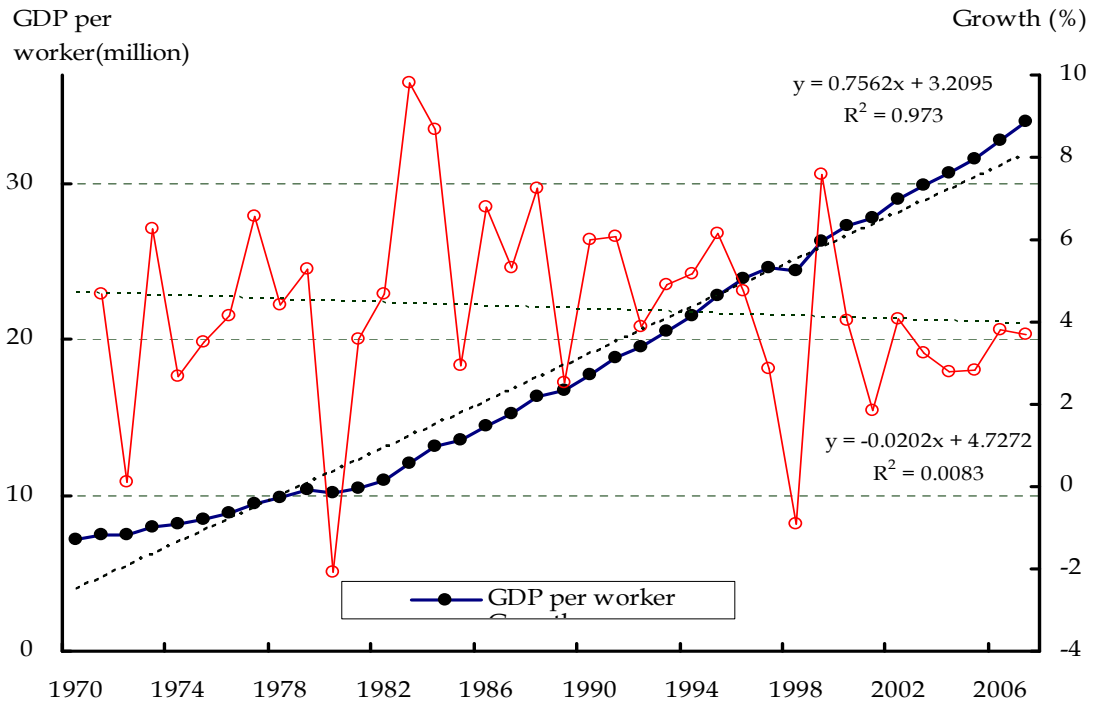
Average product of labour grew considerably but at a slightly declining rate. In accordance, number of workers needed to produce 1 billion KRW worth of output declined, but also at a slower rate in the last decade. Decomposing the employment coefficient into wage and self employment, they both declined, but at a much faster rate for the self-employed. However, the aggregate output was not decomposed into output attributable to mainly self-employment versus wage employment, and a faster decline in this coefficient for the self-employed does not mean that the self-employed were increasingly more productive than those in wage or salaried employment. The employment elasticity of output declined in a fluctuating manner. More detailed examination of each of the numbers presented in table 8 is provided below.

The average product of labour

GDP per worker grew at an average annual rate of 4.3 percent, from 7.2 million KRW in 1970 to 34.0 million KRW in 2007. Its growth rate jumped in the second sub-period (1979-1988), dropped in the third and the fourth sub-periods, and rebounded slightly in the last sub-period. The growth rate of GDP per worker has been fairly volatile, without a

significant time trend. This is confirmed in figure 15. The reasons for its volatility may be numerous. One is that it is only a contemporaneous relationship, and the labour market outcomes respond to changes in GDP with a lag. Hence, when the GDP fell in 1980 and 1998, average product of labour fell immediately since the drop in GDP was greater than the fall in employment. The subsequent rise in the average product of labour may be attributable to both the recovery of GDP and fall in employment.

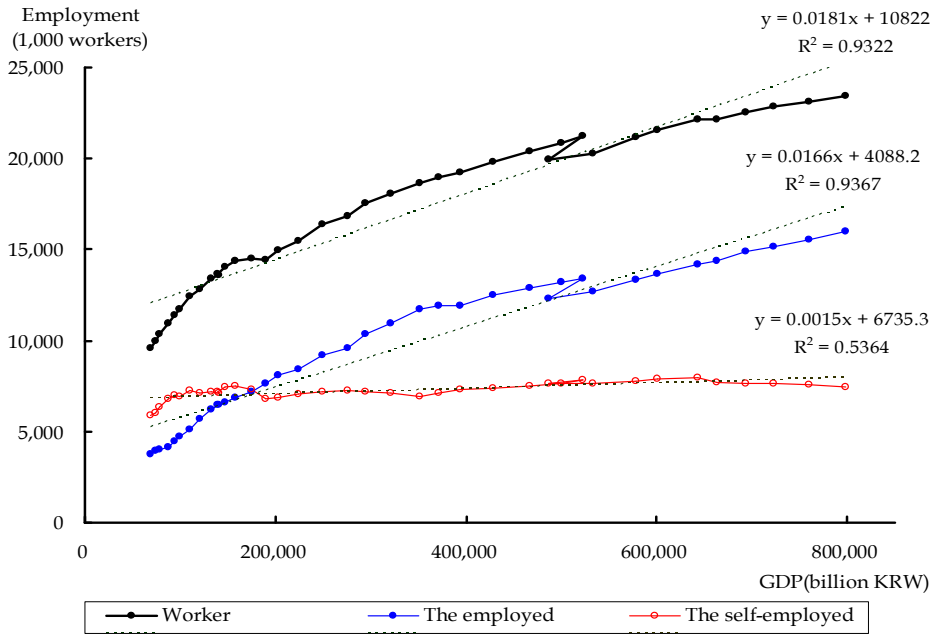
Figure 15 Long-term trend in GDP per worker (APL), 1970-2007



The employment coefficient

The long-term relationship between employment and GDP is shown in figure 16. The slope of the line from the origin to a point on the curve represents the employment coefficient. The employment coefficient tended to decline, indicating less and less workers were required every year to produce one billion KRW worth of GDP. The coefficient fell from 139.3 in 1970 to 29.4 in 2007. Such decline was larger for the self-employed (2 per year) than for the wage employed (1 per year). As noted above, because GDP was not decomposed into parts attributable to self-employment and wage employment, it can only be said that less workers were required in general to produce the same amount of output, and that this was more marked for the self-employed. On the one hand, domestic production increasingly became less labour-intensive. At the same time, as will be discussed in section 4.2, investment growth has also slowed down.

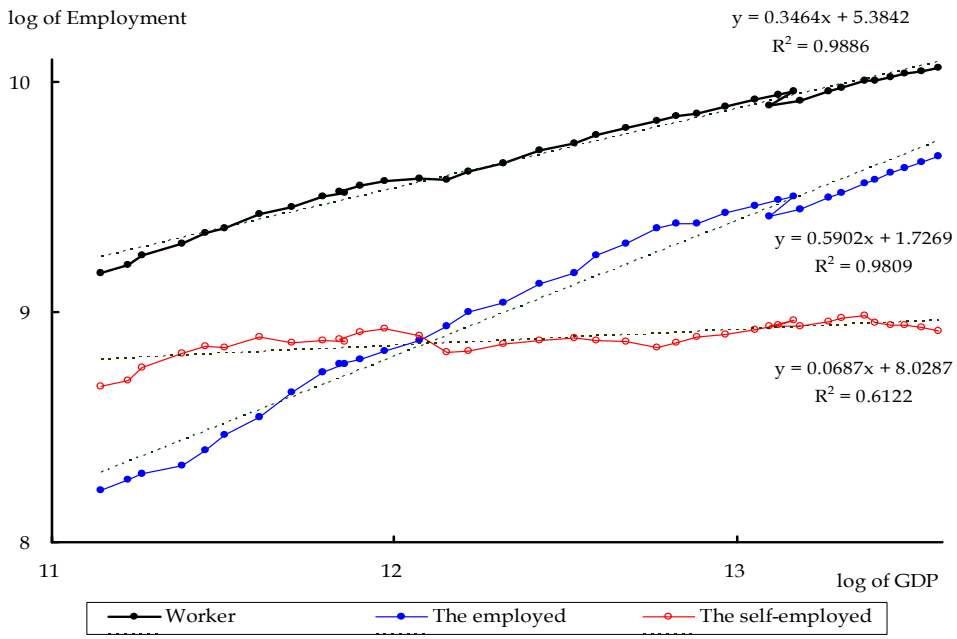
Figure 16 Long-term relationship between employment and GDP: employment coefficient



The employment elasticity

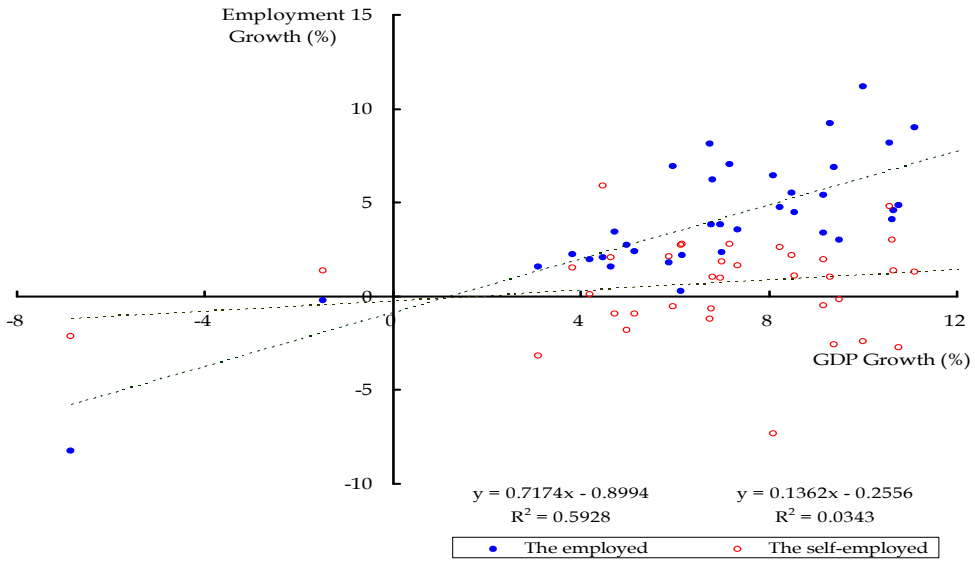
The employment elasticity, defined as the ratio of employment growth to GDP growth, between 1970 and 2007 was 0.356 (table 8). The employment elasticity showed some ups and downs by sub-periods, indicating that the relationship between employment and GDP growth had not been stable over time. In the long-run, when GDP grows by 1 percent, employment grows by 0.34 percent. The slope of the line from the origin to a point on the curve represents the employment elasticity in figure 17. The employment growth rate in response to 1 percent increase in GDP was higher for the wage employed (0.59 percent) than for the self-employed (0.06 percent).

Figure 17 The long-term relationship between employment and GDP: employment elasticity



In terms of growth rates, one percentage point higher growth rate of GDP induced 0.4 percentage point higher employment growth rate. Disaggregating to wage- and self-employment, the positive relationships between growth rates in GDP and employment were more pertinent for the wage-employed (0.7 percentage point), while such relationship seemed to be volatile and only weakly existent for the self-employed (0.1 percentage point). (See figure 18.) Notably, the only observations that appear on the fourth quadrant are for the self-employed. Hence, when GDP growth rates had been positive, there had been instances of decline in self-employment. But because decline in self-employment was not met by equivalently faster growth in wage employment, total employment growth rate slowed down as noted in section 2.

Figure 18 The long-term relationship between GDP and employment growth rates



4.1.3 The employment effect of growth

To quantify the employment effect of GDP growth, an empirical model that includes a lag of dependent variable was estimated. The dependent variables examined were: log of employment, annual employment growth rate, and employment rate.[27] The explanatory variables used were: constant, lag of dependent variable,[28] log of GDP and annual growth rate of GDP.

[27] In choosing the model, three different empirical models were first tried out. In the first model, explanatory variables were: constant, lag of dependent variable, business cycle indicator, and time trend. Including the one-period lag of dependent variable seemed to explain the next period employment outcome better than the time trend because of existence of hysteresis in the labour market. Model two, which are presented in the main texts, excluded the business cycle and time trend variables, and included instead the log of GDP and the annual growth rate of GDP. The third model included all the variables. The second model performed better than the other two models that included linear time trend and business cycle indicator. The test for the first model against the third model rejected model one for each dependent variable, while this was not eh case for the similar test conducted for model three versus model 2.

[28] Lag was not included for estimation of employment growth rate since the growth rate of employment includes its own lag on the left hand side of the estimated equation.

It can be noted that when GDP increases by 1 percent, level of employment increases by 0.3 percent[29] and employment rate rises by 5 percent, while the growth rate of employment decreases by 0.6 percentage point. (See table 9.) When GDP growth rate increases by 1 percentage point, level of employment grows by 0.02 percent, employment rate rises by 2 percent, and growth rate of employment rises by 0.4 percentage point. According to the estimated relationship, for the employment growth rate to rise, a higher GDP growth rate needs to take place.

Table 9 Employment effects of GDP, 1970-2007

Dependent variables:→	Log employment			Employment growth			Employment rate		
Constant	1.117	(0.385)	***	7.025	(4.098)	***	-2.186	(4.207)	
Lag dependent	0.804	(0.071)	***	-	-		0.907	(0.098)	***
Log GDP	0.063	(0.025)	**	-0.589	(0.315)	*	0.493	(0.242)	**
Growth of GDP	0.004	(0.001)	***	0.407	(0.065)	***	0.216	(0.039)	***
F-value	521.5	***		26.7	***		80.0	***	
Adjusted R^2	0.998			0.588			0.868		

Note: The numbers in parentheses are standard errors. *, **, *** stand for the significance level of the estimate at 0.10, 0.05, and 0.01 levels respectively.

The past growth rate of GDP affected all the dependent variables in a significant manner, and further investigation was undertaken to clarify the duration of past effects on current employment levels and growth rate. The aggregate joint outcome of the decision by enterprises to hire more people or decision by people to actively take part in economic activities would be affected by the past movements in aggregate output and economic climate. For example, if the economy grew at a high rate for the past two years, an enterprise may decide to hire more people because their business opportunities had expanded and it had identified markets that can be further exploited even if economic growth is not expected to continue at the same high rate. There may also be transaction lags, in a sense that even if enterprises wanted to hire immediately, it may take some time to find the workers with the right set of skills and experience. To explore the influence of the past values on current employment outcomes, autoregressive estimations were carried out for the three dependent variables. Lags that were included were lag of the dependent variable, lags of business cycle indicators, log of GDP and growth rates of GDP.[30]

Both GDP and its growth rates were found to have a considerably longer term effects on the level and changes in employment, as well as on employment rate. According to the estimate on employment, the combined instantaneous and long-run effect of 1 percent increase in GDP increases employment by 0.4 percent from five years back.[31] 1 percent increase in GDP increases the employment rate by 3.2 percentage points from three years back. The six-year cumulative effect of 1 percentage point increase in GDP growth rate is to increase the employment growth rate by 0.5 percentage points. In the longer-run, output

[29] $0.3 = 0.0625 \times (1 - 0.8042)$. Similar calculation is conducted for change in employment in relation to 1 percentage point increase in GDP growth rate.

[30] The empirical model used was a polynomial distributed lag model. It is a restricted form of a dynamic model.

[31] The sum of coefficients divided by $(1 - 0.343)$ gives: $(0.077 + 0.064 + 0.039 + 0.026 + 0.013)/(1 - 0.343) = 0.4$. Similar calculations are conducted to get the cumulative effects on employment rate and employment growth rate.

growth contributes much more positively to employment growth than in the immediate past. Short-run labour market adjustments in response to movements in output may be necessary, but it is equally important to ensure that longer-term regular jobs remain in place to contribute and benefit from long-run economic growth and development.

Table 10 Dynamic employment effects of GDP, 1970-2007

Dependent variables:→	Log employment			Employment growth			Employment rate		
Constant	2.889	(0.595)	***	17.687	(15.936)		20.317	(13.548)	
Lag dependent	0.313	(0.130)	***				0.783	(0.109)	***
Trend	-0.004	(0.003)	**	0.305	(0.126)	**			
BC(0)	0.002	(0.001)	***	-0.496	(0.121)	***	0.087	(0.070)	
BC(1)							-0.117	(0.057)	**
BC(2)							-0.146	(0.054)	**
Log GDP(0)	0.077	(0.022)	***				0.350	(0.165)	**
Log GDP(1)	0.064	(0.018)	***				0.234	(0.110)	**
Log GDP(2)	0.051	(0.015)	***				0.117	(0.055)	**
Log GDP(3)	0.039	(0.011)	***						
Log GDP(4)	0.026	(0.007)	***						
Log GDP(5)	0.013	(0.004)	***						
Growth GDP(0)	0.002	(0.001)	***	0.128	(0.035)	***	0.069	(0.034)	*
Growth GDP(1)	0.002	(0.0004)	***	0.110	(0.030)	***	0.052	(0.026)	*
Growth GDP(2)	0.001	(0.0003)	***	0.091	(0.025)	***	0.035	(0.017)	*
Growth GDP(3)	0.001	(0.0002)	***	0.073	(0.020)	***	0.017	(0.009)	*
Growth GDP(4)	0.0004	(0.0001)	***	0.055	(0.015)	***			
Growth GDP(5)				0.037	(0.010)	***			
Growth GDP(6)				0.018	(0.005)	***			
Durbin-Watson		1.44			2.03			2.02	
Root MSE		0.012			1.315			0.783	
AIC		-186.8			108.7			85.25	
Total R^2		0.997			0.622			0.865	

Note: The numbers in parentheses are standard errors. *, **, *** stand for the significance level of the estimate at 0.10, 0.05, and 0.01 levels respectively. For the explanatory variables, the numbers in brackets indicate number of lags. BC(i) = BC_{t-i}, i =0, 1, 2; Log GDP(i) = Log GDP_{t-i}, i =0, …, 5; gGDP(i) = $gGDP_{t-i}$, i =0, …, 6. gGDP stands for growth rate of GDP. In test statistics rows at the bottom, MSE stands for mean squared error and AIC for Akaike information criterion.

4.2 Investment and employment

The relationship and balance between physical capital accumulation and growth in employment involves many dimensions. As such, it is not a straightforward relationship both in the short- and the long-run. Classical growth accounting exercise does not provide much guidance in determining the level of investment needed to generate 'sufficient'

productive jobs, because the objective is to explain contributions of factors of production and their productivity to output growth and because one homogenous labour market clear in the long-run by assumption. In aggregate, both private and public investment contribute to both immediate and future economic growth, which can then feedback into employment effects that was explored in section 4.1 above. By different agents in the economy, enterprises drive the private decision to invest and to employ. Decision to invest has ambiguous ramification for employment at the enterprise level, and depends on the purpose and type of investment, as well as economic condition that has influenced the investment decision. For example, if the investment was undertaken to put in place more capital-intensive method of production because there are better machineries that perform efficiently and require little maintenance, then substitution effects may dominate and there would be less need for workers. If investment took place to set up a new factory, then such projects tend to generate both immediate and longer-term employment opportunities. By public sector, the decision to invest is influenced by many considerations, such as feasibly inducing further investment by private agents, provision of public goods which no single private agent would willingly undertake, social returns, exploiting externality, such as trading networks, through more inter-regional integration, and so on. Furthermore, many public investment projects can be implemented by using labour-intensive technology. With such complications in mind, the section explores empirical long-term relationship between investment and employment in Korea.

4.2.1 Long-term trend in investment

Investment was measured by gross capital formation and gross fixed capital formation. Gross fixed capital formation grew at an annual average rate of 9 percent between 1970 and 2007. It grew rapidly during the 1970s, slowed down on average during the 1980s before picking up again in 1988-1996. What is most notable about the historical investment pattern is that it dropped sharply during the foreign exchange crisis in 1998, grew at a negative average annual rate during 1996-2002, and its growth rate recovered only moderately after 2002 (table 11). The slow growth rate in investment may have been one of the key factors behind slow economic growth over the last decade, with subsequent impact on employment growth. The long-term trend in gross fixed capital formation was also further decomposed by types of capital goods. These types of investment are: construction investment, facilities investment, and intangible fixed assets.[32]

Table 11 Long-term trend in investment, 1970-2007

Year/Period	CapForm	CapFix	CapFix1	CapFix2	CapFix3
Level (billion KRW)					
1970	10,998	10,320	8,020	2,222	78
1979	44,328	40,078	23,278	16,532	267
1988	82,690	79,032	46,992	30,649	1,392
1996	198,589	196,550	112,918	77,759	5,873
1997	188,104	192,034	115,477	70,308	6,249
1998	130,566	147,992	101,197	40,586	6,209
2002	189,898	191,465	107,883	72,556	11,025
2007	221,371	224,176	118,754	91,297	14,125

[32] Construction includes residential buildings, non-residential buildings, and other constructions. Facilities investment includes transport equipment and machinery equipment.

Average annual growth rate (%)					
1970-07	8.45	8.68	7.56	10.56	15.08
1970-79	16.75	16.27	12.57	24.98	14.64
1979-88	7.17	7.84	8.12	7.10	20.11
1988-96	11.57	12.06	11.58	12.34	19.72
1996-02	-0.74	-0.44	-0.76	-1.15	11.07
2002-07	3.11	3.20	1.94	4.70	5.08

Note:

CapForm = gross capital formation

CapFix = gross fixed capital formation

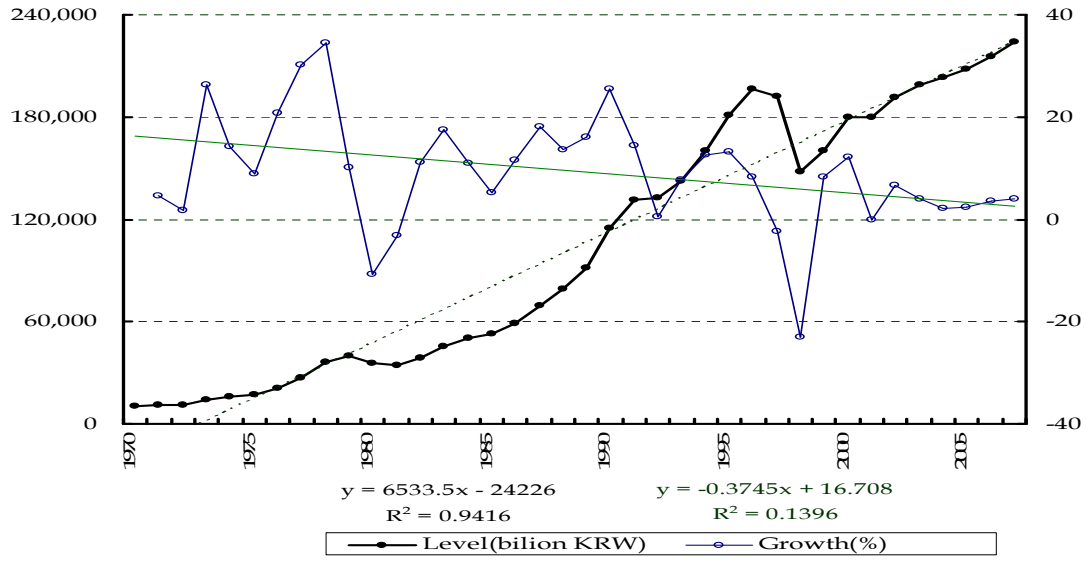
CapFix1 = construction

CapFix2 = facilities

CapFix3 = intangible fixed assets

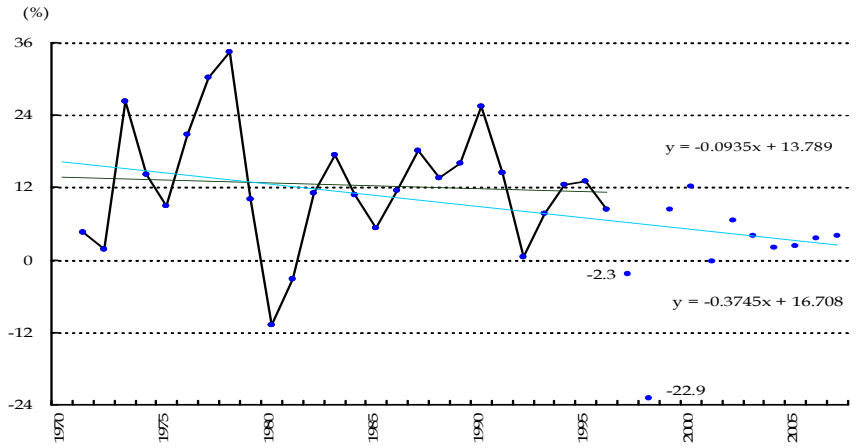
Declining trend of investment on fixed capital since the foreign exchange crisis can be observed in figure 19. The growth rate of investment declined on average by 0.4 percentage point per year. Following the 1997 exchange rate shock, the investment growth rate declined to -2 percent in 1997 and -23 percent in 1998. During the past four years, the investment growth rate converged towards its long-term linear trend, and it can be interpreted that the investment growth rate is back on its track.

Figure 19 Trend in gross fixed capital formation, 1970-2007



When a linear time trend in investment growth rate is fit up to 1996, the long-term trend decline in investment growth rate was close to zero and only by 0.1 percentage point per year, as against 0.4 percentage point (figure 20). While there were volatilities in investment growth in the past, it took place around its long-term mean. On the surface, there was a break in a long-term linear trend after the exchange rate shock, and there seems to have been a long-term negative shock to the mean growth rate of investment. In the decade following 1997, investment growth rates fluctuated much less than it had in the past and fluctuated around a lower average.

Figure 20 Trend in investment growth rate, 1970-2007

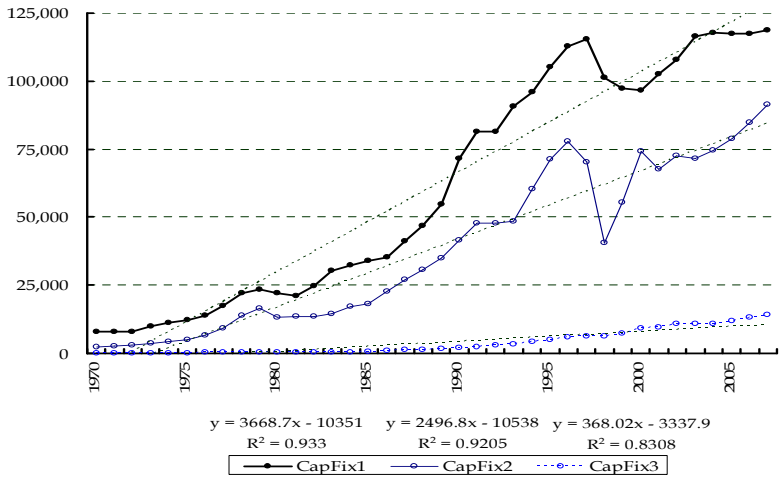


Note: A linear trend line up until 1996 was fitted.

In terms of the components of gross fixed capital formation, the negative impact of the foreign exchange crisis was stronger for facilities investment than for other types of investment (table 11). In the fourth sub-period that included the crisis years, the average annual growth rate of facilities and construction investment dropped to -1 percent from 12 percent in the preceding sub-period. The growth rate of intangible fixed assets was less affected and remained positive at 11 percent, even though this was almost half of its average growth rates in the previous two sub-periods. During the last sub-period, the growth rate of facilities investment and investment on intangible fixed assets rebounded to 5 percent, while that of construction investment remained at a lower level of 2 percent.

With regard to long-term linear time trends, the immediate impact of foreign exchange crisis was the strongest for facilities investment (CapFix2), and its negative impact on construction investment (CapFix1) lasted for a long time (figure 21). Such long-term negative effects were not noticeably observable in the other two types of investment, as they seemed to have recovered to their trend levels.

Figure 21 Trend in fixed capital formation levels by types, 1970-2007



Note: CapFix1 = construction investment
CapFix2 = facilities investment
CapFix3 = intangible fixed assets

To examine the types of investment that drove the observed break in linear trend in total investment, a linear trend line was also fit for the period up to 1996 (figure 22, panels

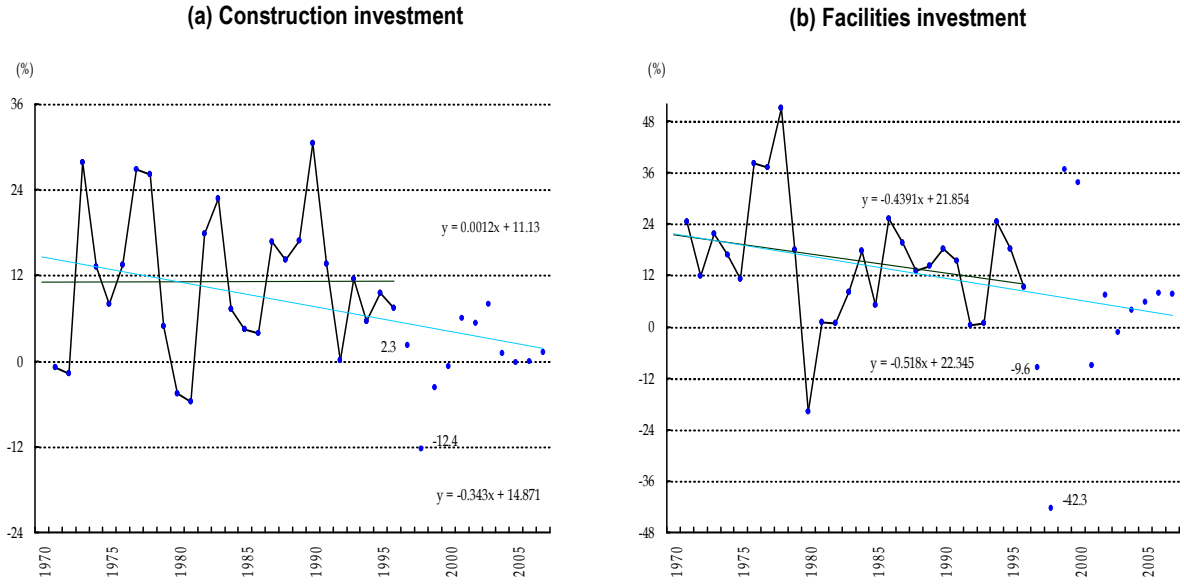
(a) to (c)). On the surface, such break was driven by shifts in construction and intangible fixed asset investment.

Construction investment (figure 22 panel (a)) suffered a negative growth rate at the time of the foreign exchange crisis (-12 percent in 1998), and its growth rate remained negative for the subsequent two years. Over the whole period, the growth rate in construction investment was declining at 0.3 percentage point per year. When this trend only up to 1996 is examined, however, there was no obvious negative trend and fluctuations in growth rates seemed to have taken place around its long-term mean. On the surface, then, the recent decade was marked by a lower long-term average growth rate in construction investment.

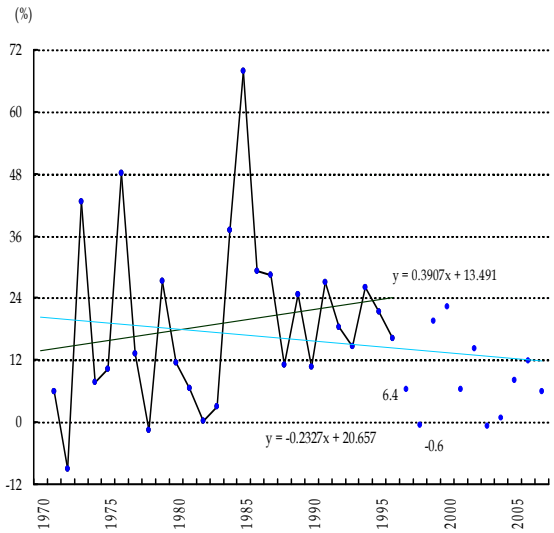
The growth rate of facilities investment became negative in 1997 (-10 percent) and plummeted to -42 percent in 1998 (figure 22, panel (b)). Fitting the linear trend line for 1970-1996 and 1970-2007, it can be seen that whichever trend line is applied, the growth rate of facilities investment was on the decline. Between 1970 and 2007, the average rate of decline in growth rate was slightly faster: by 0.5 percentage point as against 0.4 percentage point if only the observations up to 1996 were used. The growth rate of facilities investment seemed to have returned to its long-term trend, and the crisis period may have been a sharp but a transitory shock.

The growth rate of investment in intangible fixed assets became a near-zero negative rate in 1998 at 0.6 percent. It had since remained positive, except in 2003 (figure 22, panel (c)). For the whole period, the growth rate of investment on intangible fixed assets had been decreasing at an average rate of 0.2 percentage point every year. In contrast, if observations only up to 1996 are used, the time trend had been positive, increasing at 0.4 percentage point a year. The growth rate in fixed intangible assets had not yet recovered to its previous trend yet.

Figure 22 Growth rates of fixed investment by types, 1970-2007



(c) Intangible fixed assets



The above remarks based on visual presentations can also be confirmed by a trend analysis (table 12). There was a significant business cycle effect on the growth rate of fixed capital formation and facilities investment but not on construction investment and investment in intangible fixed assets. There were no significant business cycle effects on the log levels of any types of investment.

Table 12 Trend analysis of investment, 1970-2007

Dependent variables:	Trend			BC			Adjusted R^2
Fixed capital formation							
(1) Log level	-0.369	(0.150)	**	1.686	(0.783)	**	0.199
(2) Growth rate	-0.103	(0.049)	**	0.682	(0.257)	**	0.211
Construction investment							
(1) Log level	0.081	(0.004)	***	0.018	(0.020)		0.927
(2) Growth rate	-0.339	(0.144)	**	1.252	(0.755)	**	0.151
Facilities investment							
(1) Log level	0.096	(0.005)	***	0.043	(0.027)		0.910
(2) Growth rate	-0.511	(0.245)	**	2.225	(1.284)	*	0.132
Investment on intangible fixed assets							
(1) Log level	0.158	(0.004)	***	0.015	(0.020)		0.981
(2) Growth rate	-0.230	(0.241)		0.731	(1.260)	*	-0.021

Note: Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100). Constant term was also included, but not presented in the table.

Hence, investment growth rates had been on the declining trend, particularly after 1997 crisis for construction investment and investment on intangible fixed assets. For the construction sector, lack of investment is also reflected in rapid rise in labour share in income in construction (figure 8). Such decline in investment results in current and future constraints on economic growth, and can result in less employment growth in the future as well. The likelihood of this scenario is explored further in the following subsections.

4.2.2 *Relationships among different types of investment*

Before examining the relationship between employment and investment, this subsection first clarifies the relationship between different types of investment. A priori, different types of investment may be related to each other. For instance, more construction investment may result in more facilities investment in the subsequent periods. Enterprises may decide to invest in equipments and machinery only after workplaces and physical network infrastructure facilities are secured. Alternatively, enterprises may decide to invest in equipment and machinery because the timing for obtaining good investment deals was right, and subsequently either invest themselves or induce other investors for the expansion of buildings and other infrastructural facilities.

Granger causality tests among three types of investment were carried out to see if such inter-relationships existed (table 13). In examining two types of fixed capital formation – construction and facilities investment – facilities investment Granger-caused construction investment when their values of preceding year was taken into account. Construction investment Granger-caused facilities investment when their values of preceding two years were taken into account. In other cases, there were no statistical causal relationships among different types of investment. The detailed results of VAR estimation can be found in appendix A, tables A.1 and A.2.

Table 13 Test for Granger causality among investment types

	Model 1		Model 2	
Model H_0	**Y_2 not $\Rightarrow$ Y_1**	**Y_1 not $\Rightarrow$ Y_2**	**Y_2 & Y_3 not $\Rightarrow$ Y_1**	**Y_1 not $\Rightarrow$ Y_2& Y_3**
VAR(1)	3.34	2.11	3.27	4.12
VAR(2)	1.07	5.06	2.76	8.86
VAR(3)	1.21	5.11	3.73	15.98
VAR(1) with trend	0.36	0.16	2.29	2.29
VAR(1, 0) with trend	0.36	0.16	2.29	2.29

Note: The numbers presented are the chi-squared test statistics for the null hypothesis that one type of investment does not Granger-cause another type of investment. The rejection of the null hypothesis (bold numbers) means that at least one parameter in the past values of explanatory variables was found to be significantly different from zero. Model 1 used two types of fixed capital formation (construction and facilities investment) and Model 2 used three types. Y1 = construction investment, Y2 = facilities investment, and Y3 = investment on intangible fixed assets. VAR(ρ) means that the time series vector of investment types was generated by a stationary vector autoregressive process of order ρ = 1, 2, 3.

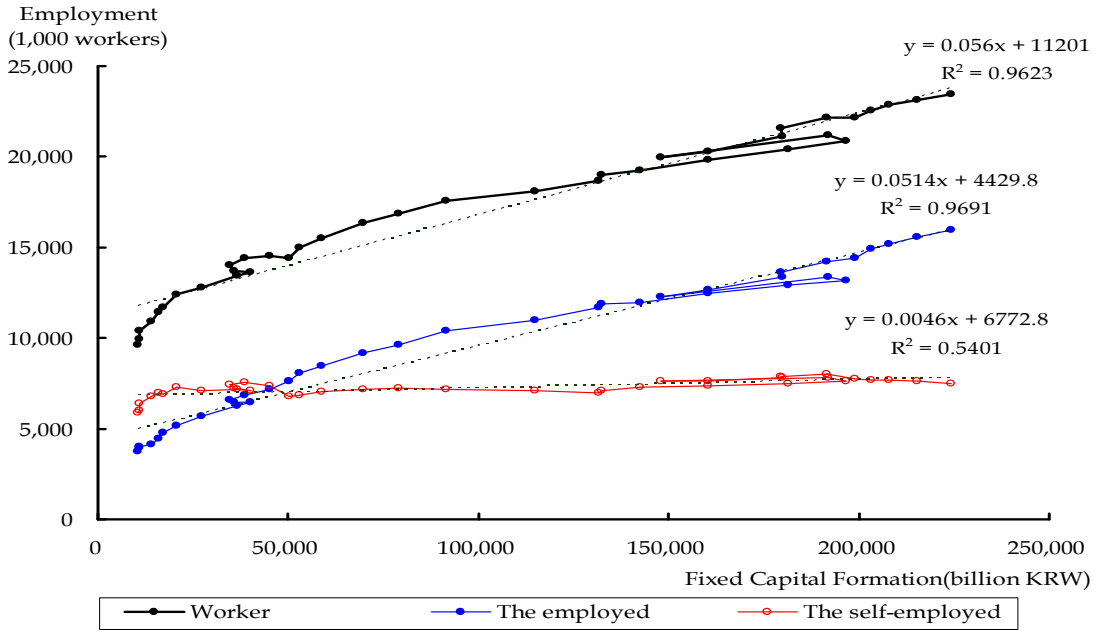
4.2.3 *Long-term relationship between investment and employment*

The level of aggregate investment measured in gross fixed capital formation was found to be positively related with aggregate employment (figure 23). One unit increase in investment (one billion KRW) leads to an increase of 56 workers. Such positive relationship was steady over time, after the initial decade where one unit rise in investment was associated with a larger increase in total employment.[33] More investment directly generates employment via direct engagement in investment projects or if they represent a

[33] The employment effects of each type of investment are presented in Appendix B. Estimations were conducted separately by investment types (table B.1) and jointly (table B.2).

start of new establishments. Indirectly, more investment results in more employment if they represent business expansion or improved returns to business. Such positive relationship was observable for the wage-employed but not for the self-employed. It indicates that the self-employed faced limited scope of investing in improvement and expansion of their own businesses. Facilitating the upgrading and expansion of owner run businesses would contribute towards a more balanced distribution of establishment sizes, as well as generation of more accessible job opportunities.

Figure 23 Gross fixed capital formation and employment, 1970-2007



4.3 FDI and employment[34]

There have been numerous studies that had focused on foreign direct investment (FDI), its contribution to economic growth and employment. Kim (1997) noted that FDI played a negligible role in Korea's economic development due to fear of foreign firms' domination. It was the government's strategy to channel the limited amount of capital resources to industries that were considered vital for the country's long-term economic growth (Kim and Wang, 1996), while FDI started to play a more important role when the economic growth faced a bottleneck due to technological constraints. Through case studies, they found that FDI contributed to semiconductor industry by transferring technology, to pharmaceutical industry by raising research capabilities, and retail industry by replacing the manufacturer-dominated structure with the retailer-dominated one. Hong (1998) examined the relationship between FDI and national- and firm-level competitiveness via technological capabilities. It was found that private firms, encouraged by policy, adopted an efficient R&D strategy, which was supplemented by active inducement of FDI for technology transfer and for customer services. The Bank of Korea (2008.05) analyzed the

[34] There have been some studies on the determinants of FDI such as Lee (2003) which focused on labour market institutions; Lee and Chun (2003), which examined the effects of per capita GDP, wage differentiation, export and imports, market concentration ratio on FDI by industries in the manufacturing sector ; Bank of Korea (2007.12) which identified the stability in land prices, stock prices and improvement of foreign investment policies.

effects of FDI on facilities investment and employment by investment types, such as manufacturing sector including IT and service sector. After noting on the significant increase in FDI since 1998, the Bank of Korea (2007.12) analyzed the factors that induced FDI by investment types and by industries, and the factors included land price stabilization, stock prices, and foreign investment policies.

4.3.1 Trend in FDI

The Korean FDI policy since 1960 can be classified into three phases: institutionalization phase (1960-1983), liberalization phase (1984-1995), and active liberalization phase (1996-present).[35] The institutionalization phase started with enactment of Foreign Capital Inducement Act in 1960, which has been the primary law regulating inward direct investment to ease the balance-of-payment difficulties, providing necessary technologies and expertise, and opening the markets for outward-looking development. During this phase, Free Export Zones at Masan and Iri were established in 1970 and 1974 to welcome foreign direct investors in light manufacturing export sector but not in import-substituting sectors.

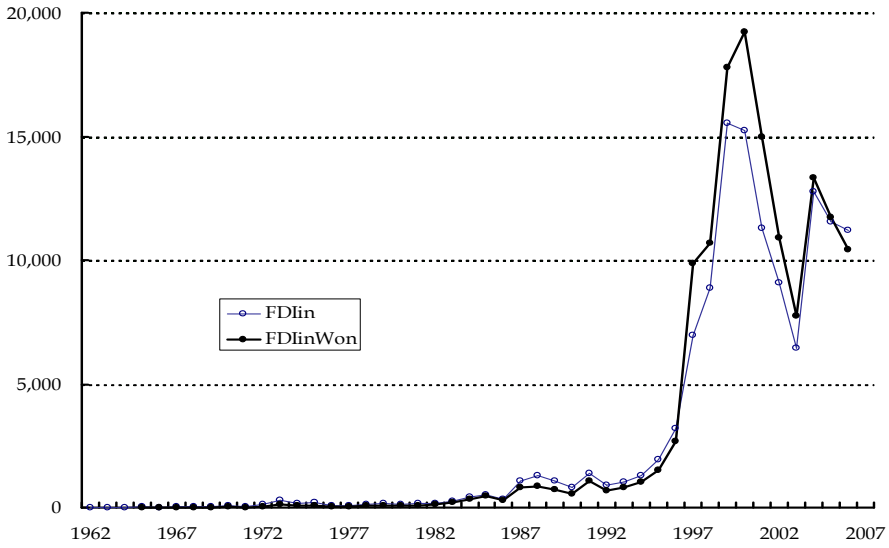
The liberalization phase was a period to ease FDI flows to counter serious difficulties generated by the negative effects of the Heavy and Chemical Industry Promotion Plan of the 1970s. During the period, there was also an effort to upgrade the economy into more technology-based and skill-intensive industrial structure. The major policy change started with adopting the negative list system in 1984, which made it possible to open many manufacturing subsections to FDI. It was followed by changes that abolished performance requirements in 1989, adoption of the notification-oriented system in 1992, reduction of application processing period in 1994, and introduction of a one-stop service system in 1995.

The active liberalization phase started with the Five-year Foreign Investment Liberalization Plan and amendment of Foreign Capital Inducement in 1996. The Plan aimed to further expand the scope of FDI liberalization by reducing restricted business categories from 57 in 1996 to 18 in 2000. The main purpose of the Act was to remove restrictive measures and to realign Korea's foreign direct investment system in line with international norms and standards. The Act allowed mergers and acquisitions, and in 1998 foreign exchange was liberalized.

In cumulative response to the above policies, FDI started to increase in a limited manner around the early 1980s (figure 24). It rapidly grew between 1996 and 2000 and has been volatile since then. The level or growth of FDI was increasing in the long-run, but it was unrelated to the business cycle (table 14).

[35] Studies that characterize FDI policy can be found in Kim (1997), Nam and Yun (2005), and Hong (2007).

Figure 24 Trend in FDI inflow, 1962-2007



Note: The unit is thousand dollars for FDIin and billion KRW for FDIinWon.

Table 14 Trend analysis of FDI, 1970-2007

Dependent variables:	Trend			BC		Adjusted R^2
(1) Level	406.9	(59.7)	***	-87.5	(308.7)	0.556
(1) Log level	0.193	(0.009)	***	0.025	(0.047)	0.925
(2) Growth rate	-0.742	(1.181)		7.997	(5.931)	-0.007

Note: Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100). Constant term was also included, but not presented in the table.

4.3.2 Effect of FDI on employment

The dynamic employment effect of FDI was positive, and FDI had a long-lasting effect. According to the long-run multiplier, one unit increase in FDI would induce increase of 2.2 percentage points in employment rate (table 15). By easing technological constraints on economic growth, FDI contributed towards generation of further employment through both direct and indirect effects.

Table 15 Dynamic employment effects of FDI, 1970-2007

Dependent variable: Employment rate			
Constant	-6.126	(7.217)	
EmpRate(-1)	0.880	(0.098)	***
Growth GDP	0.204	(0.047)	***
BC	0.101	(0.077)	
LFDI(0)	0.065	(0.022)	***
LFDI(1)	0.056	(0.018)	***
LFDI(2)	0.046	(0.015)	***
LFDI(3)	0.037	(0.012)	***
LFDI(4)	0.028	(0.009)	***
LFDI(5)	0.019	(0.006)	***
LFDI(6)	0.009	(0.003)	***
DW	1.947		
RMSE	0.711		
AIC	71.4		
Total R^2	0.891		

Note: the numbers in parentheses are standard errors. *, **, and *** stand for the significance level of estimate at 0.10, 0.05 and 0.01 levels respectively. EmpRate(-1) = 1-year lag of employment rate, BC = business cycle indicator, LFDI(ρ) stand for log value of FDI with ρ lags (ρ = 0, …, 6).

4.4 Inter-relationships between investment, growth and employment

Data on investment, output and employment is analyzed together by applying a flexible macroeconometric tool. The vector-autoregression analysis imposes very little structure on the relationships amongst the variables under consideration. However, a limited number of variables selected means that other determining factors, such as changes in trade patterns, technological development and adoption, and labour market institutions, are not taken into account. This subsection presents a first analytical step towards clarifying the extent to which investment, output and employment levels in the past had been linked to each other. It is unfortunately beyond the scope of current work to analyze other factors that also played a critical role in determining employment outcomes in Korea.

First, the relationships between various types of investment were first examined (Appendix C figure C1-8). In general, they all seem to be positively related to each other, and the positive association was strongest between levels of construction investment and FDI. In terms of growth rates, however, there were generally no noticeably significant relationships between growth rates of various types of investment. Only moderately positive relationships between construction and facilities investment and between facilities and intangible fixed assets investment are observed.

Estimation of the VAR model

Due to the observed positive relationships between various types of investment levels, the vector autoregressive (VAR) models of order one (VAR(1)) and two (VAR(2)) with exogenous variables were estimated.[36]

The estimates of the VAR(1) model shows that all four types of investment were affected by their previous levels in a positive manner (appendix table D.1). It indicates some degree of self-reinforcing investment patterns. For construction and facilities investment, trend variables and business cycle indicators showed significant positive relationships. Investment in intangible assets was only marginally affected by such trend variables, and FDI seemed to be independent of time trend and business cycles. Construction investment was positively affected by the previous investment on intangible assets and negatively affected by the previous levels of FDI. Facilities investment was negatively affected by the previous level of FDI.[37] Investment on intangible assets was affected by the previous levels of construction and facilities investment. The level of FDI was not affected by other three types of investment. As can be seen from figures 21 and 24, the dramatic expansion and subsequent large fluctuations in FDI since the mid-1990s was very different from the pattern of growth in other types of investment.

When two-period lags were included, however, all four types of investment were affected by their immediate previous levels in a positive manner but negatively affected from two years back. For investment on intangible assets and FDI, such negative two-lag relationships were not significant. Construction investment was negatively affected by the previous levels of FDI, but no longer affected by the previous level of investment in fixed assets. Facilities investment was still negatively affected by the previous level of FDI. This could be indicating a possible crowding out effect by FDI on facilities investment.

The VAR(1) model was expanded to include the levels of employment and GDP (appendix table D.2). Contrary to expectations, construction and facilities investment did not have a significant impact on employment, and the signs of the coefficients were negative. According to the estimates, previous investment on intangible assets had a positive impact on employment while previous level of FDI had a negative impact. Employment outcomes had also been driven by business cycle and its own past level. The observed persistence in the employment series and a lack of responsiveness of employment to past levels of economic output and construction and facilities investment can be confirming the persistence of certain types of existing jobs and insufficient generation of new ones. This was also observed in the trend in employment accession and separation rates. This provides some indication that economic structure that links output to

[36] The VAR(1) model was of the form:

$$Y_{1t} = a_{11}Y_{1,t-1} + a_{12}Y_{2,t-1} + a_{13}Y_{3,t-1} + a_{14}Y_{4,t-1} + b_1X_t + \varepsilon_{1t}$$

$$Y_{2t} = a_{21}Y_{1,t-1} + a_{22}Y_{2,t-1} + a_{23}Y_{3,t-1} + a_{24}Y_{4,t-1} + b_2X_t + \varepsilon_{2t}$$

$$Y_{3t} = a_{31}Y_{1,t-1} + a_{32}Y_{2,t-1} + a_{33}Y_{3,t-1} + a_{34}Y_{4,t-1} + b_3X_t + \varepsilon_{3t}$$

$$Y_{4t} = a_{41}Y_{1,t-1} + a_{42}Y_{2,t-1} + a_{43}Y_{3,t-1} + a_{44}Y_{4,t-1} + b_4X_t + \varepsilon_{4t}$$

where the endogenous variables are: Y_1 log of construction investment, Y_2 log of facilities investment, Y_3 log of investment on intangible assets, and Y_4 log of FDI. The exogenous variables (X) consist of quadratic time trend and business cycle indicators. The VAR(2) model expands the above model with inclusion of another lag.

[37] The Bank of Korea (2008.05) showed that 1 percent increase in FDI induces increase in facilities investment by 0.08 percent and that of FDI of 11.5 billion dollars per year between 1999 and 2007 created about 155 thousand new jobs.

employment may have been weakened. The results also provide some indication that the economic and institutional structures had not been favourable towards workers who had lost their regular jobs as well as young people who are entering the labour markets for the first time.

Nevertheless, the estimated results are preliminary, and interpretation needs considerable caution. For instance, the negative coefficient of the previous level of FDI can mean that jobs generated by FDI were not sufficient to replace jobs that were destroyed by FDI. But FDI series was also visibly different from other series included in the estimation procedure. Non-stationarity of the FDI series can be strongly affecting the current results obtained.

5. Conclusions

The Korean economy experienced a remarkably steady and rapid growth since 1960s, even though there were two episodes of negative growth in 1980 and in 1997. Such high rate of economic growth resulted in a steady increase in employment level, while its growth rate has been on a declining trend. The issue of 'jobless growth' or the possibility that such phenomenon would emerge has been debated when the level of employment grew at a slightly negative rate in 2003 in spite of positive economic growth rate. And what matters is not merely the possibility of insufficient level of employment in relation to working age population, but also an increasing inequality in the labour market outcomes since the late 1990s.

This study explored empirical relationships among employment, economic growth and various types of investment. The study had a narrow focus on very few macroeconomic variables, and the empirical results are preliminary. The different types of investment considered were: construction investment, facilities investment, investment in intangible assets, and FDI. The main empirical findings can be summarized as below.

First, the level of total employment increased steadily at an average annual growth rate above two percent. It experienced three episodes of negative growth in 1984, 1998 and 2003. Its growth rate, however, has slowed down over the last decades, and recently plummeted to just above one percent. The recent slowdown of its growth can be attributed to deficient investment, limited access to regular jobs, as well as the sluggish economic growth since the foreign exchange crisis.

Second, when examining employment at a disaggregated level, the slower growth of total employment, which has triggered the recent discussion on 'jobless growth' or its possibility, was mainly due to on-going restructuring of self-employment. It was compounded by a recently low rate of growth in wage and salaried employment, suggesting that those who could not survive in self-employment might have also lacked access to wage employment. Together, they contributed to the negative growth in employment. Just after the foreign exchange crisis, individuals who were unemployed and could not find another job chose self-employment as income generating activities of last resort. At the same time, the government policies encouraged self-employment in order to reduce a record high rate of unemployment and to sustain workers' and their families' incomes. It resulted in too many workers in self-employment, in comparison to lower demand for the non-tradable services they produced. As a result, restructuring of self-employment has been taking place since 2003. If a majority of self-employed can be considered to be "vulnerable", further analysis is needed to clarify whether such restructuring of self-employment is a positive development. It very much depends on the alternative forms of employment or labour market status in terms of unemployment or inactivity they transited into.

Third, the employment-to-population ratio was on an increasing trend around a long cycle. When examined by its demographic groups, the employment-to-population ratio of

women increased steadily over the last four decades, while that of men was on a decrease. Such positive trend in women's employment-to-population ratio can be attributed to a rise in the number of more educated women who would be more likely to work. Also, more educated women above the age of 25 tended to postpone marriage and to give less births. Such change in behaviour is reflected in a remarkable shift in female age and labour force profile from a typical M-shaped one to a U-shaped one.

Fourth, economic growth has a significantly positive effect on total employment as well as employment-to-population ratio, as found by employment elasticity, the relationship between economic growth and employment growth. Investment and its components have additional positive employment effect. However, these effects on employment had been considered separately, and employment elasticity was low in 2000s compared to the previous periods. It gives some grounds to suspect a weakened structural relationship between output growth and employment.

Finally, when employment, output and various types of investment are jointly considered together in a VAR model, the estimates imply that the previous levels of GDP, construction investment, and facilities investment do not affect the current level of employment, while those of investment on intangible assets and FDI had positive and negative effects respectively. Also, the current level of employment was explained by its own past value as well as business cycle indicator. This result should be carefully interpreted because FDI has been liberalized relatively recently, and there had been substantial and abrupt fluctuations in FDI inflow in response to deepening liberalization policy. The findings are preliminary, and there are other empirical approaches to identify employment effect of FDI from a longer-term perspective. The models estimated assumed a stationary process and may have failed to capture the volatility in FDI.

The current study suggests that much more efforts are needed to identify and quantify additional employment effects of various types of investment, including FDI. Furthermore, much more empirical work is needed to explore the relationship between mechanisms that generate investment and economic growth and labour market institutions to understand if labour force polarization since the late 1990s should be a long-term concern and how such trend may have affected the more vulnerable segments in the labour force in the recent 2008 crisis.

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Appendix A

Table A.1 Estimates of VAR(*ρ*) model with two types of investment

Model	Endo	Y_1(-1)		Y_2(-1)		Y_1(-2)		Y_2(-2)		Y_1(-3)		Y_2(-3)
VAR(1)	Y_1	0.780	***	0.157	*							
		(0.102)		(0.086)								
	Y_2	0.270		0.718	***							
		(0.186)		(0.156)								
VAR(2)	Y_1	1.195	***	0.114		-0.305	*	-0.048				
		(0.204)		(0.112)		(0.173)		(0.105)				
	Y_2	0.659	*	0.776	***	-0.173		-0.235				
		(0.387)		(0.212)		(0.328)		(0.200)				
VAR(3)	Y_1	1.275	***	0.110		-0.654	**	-0.096		0.310	*	0.007
		(0.201)		(0.106)		(0.284)		(0.127)		(0.171)		(0.101)
	Y_2	0.743	*	0.793	***	-0.574		-0.395		0.318		0.125
		(0.403)		(0.213)		(0.568)		(0.254)		(0.342)		(0.201)

Note: Vector autoregressive process of order *ρ*, VAR(*ρ*), model with no exogenous variables and no time trend. Endo = endogenous variables, Y_1 = construction investment, and Y_2 = facilities investment. Standard errors are in parenthesis. Estimates with *, **, and *** stands for significance at 0.10, 0.05 and 0.01 levels respectively. Constant was included in the model but not presented.

Table A.2 Estimates of VAR model with exogenous variables

Model	Endo	Trend		$Trend^2$		BC		Y_1(-1)		Y_2(-1)		Y_3(-1)	
(1)	Y_1	0.044	**	-0.001	**	0.014	**	0.734	***	0.005			
		(0.018)		(0.0003)		(0.007)		(0.117)		(0.093)			
	Y_2	0.086	***	-0.001	***	0.038	***	0.135		0.423	**		
		(0.030)		(0.0004)		(0.011)		(0.196)		(0.156)			
(2)	Y_1	0.037	**	-0.001	***	0.014	**	0.627	***	0.015		0.111	
		(0.018)		(0.0003)		(0.006)		(0.136)		(0.091)		(0.076)	
	Y_2	0.081	**	-0.001	***	0.038	***	0.067		0.430	**	0.071	
		(0.031)		(0.0004)		(0.011)		(0.235)		(0.158)		(0.131)	
	Y_3	0.074	***	-0.001	***	0.013		0.306		-0.302	**	0.765	***
		(0.026)		(0.0004)		(0.009)		(0.195)		(0.131)		(0.109)	

Note: Model (1) is VAR(1) with two types of investment, with exogenous variables BC and quadratic trend. Model (2) VAR(1,0) with three types of investment, with exogenous variables. *Trend*=Year–1969; *BC*=Business cycle indicator (2005 = 100), Y_1=construction investment, Y_2=facilities investment and Y_3=investment in fixed assets. Standard errors are in the parentheses. Estimates with *, **, and *** stands for significance at 0.10, 0.05 and 0.01 levels respectively. Constant was included in the model but not presented.

Appendix B

Table B.1 Dynamic employment effects of investment, 1970-2007

Dependent variable = employment rate											
Gross fixed capital				**Construction investment**				**Facilities investment**			
Constant	-7.419	(7.431)		Constant	-7.731	(7.437)		Constant	-7.925	(7.802)	
EmpRate(-1)	0.897	(0.110)	***	EmpRate(-1)	0.896	(0.111)	***	EmpRate(-1)	0.812	(0.132)	***
gGDP	0.214	(0.049)	***	gGDP	0.213	(0.049)	***	gGDP	0.185	(0.055)	***
BC	0.067	(0.079)		BC	0.071	(0.080)		BC	0.099	(0.091)	
LCapFix(0)	0.134	(0.062)	**	LCapFix1(0)	0.141	(0.066)	**	LCapFix2(0)	0.137	(0.054)	**
LCapFix(1)	0.112	(0.051)	**	LCapFix1(1)	0.117	(0.055)	**	LCapFix2(1)	0.123	(0.048)	**

LCapFix(2)	0.089	(0.041)	**	LCapFix1(2)	0.094	(0.044)	**	LCapFix2(2)	0.110	(0.043)	**
LCapFix(3)	0.067	(0.031)	**	LCapFix1(3)	0.070	(0.033)	**	LCapFix2(3)	0.096	(0.038)	**
LCapFix(4)	0.045	(0.021)	**	LCapFix1(4)	0.047	(0.022)	**	LCapFix2(4)	0.082	(0.032)	**
LCapFix(5)	0.022	(0.010)	**	LCapFix1(5)	0.024	(0.011)	**	LCapFix2(5)	0.068	(0.027)	**
								LCapFix2(6)	0.055	(0.022)	**
								LCapFix2(7)	0.041	(0.016)	**
								LCapFix2(8)	0.027	(0.011)	**
								LCapFix2(9)	0.014	(0.005)	**
DW	1.846			DW	1.838			DW	1.665		
RMSE	0.750			RMSE	0.752			RMSE	0.744		
AIC	79.26			AIC	79.44			AIC	69.63		
Total R^2	0.875			Total R^2	0.874			Total R^2	0.890		

Note: EmpRate(-1) = employment rate at $t - 1$

CapFix(ρ) = gross fixed capital formation, with ρ lags

CapFix1(ρ) = construction investment, with ρ lags

CapFix2(ρ) = facilities investment, with ρ lags

gGDP = annual growth rate of GDP

BC = business cycle indicator

Standard errors are in parentheses. Estimates with *, **, and *** stands for significance at 0.10, 0.05 and 0.01 levels respectively.

Table B.2 Employment effect of construction and facilities investment: PDL regression, 1970-2007

Explanatory variables	Two types of investment: construction and facilities		
Constant	12.691	(12.413)	
EmpRate(-1)	0.780	(0.125)	***
Growth GDP	0.241	(0.061)	***
BC	0.003	(0.090)	
LCapFix1(0)	-1.552	(0.798)	*
LCapFix1(1)	-1.433	(0.737)	*
LCapFix1(2)	-1.314	(0.676)	*
LCapFix1(3)	-1.194	(0.614)	*
LCapFix1(4)	-1.075	(0.553)	*
LCapFix1(5)	-0.955	(0.491)	*
LCapFix1(6)	-0.836	(0.430)	*
LCapFix1(7)	-0.716	(0.369)	*
LCapFix1(8)	-0.597	(0.307)	*
LCapFix1(9)	-0.478	(0.246)	*
LCapFix1(10)	-0.358	(0.184)	*
LCapFix1(11)	-0.239	(0.123)	*
LCapFix1(12)	-0.119	(0.061)	*
LCapFix2(0)	1.607	(0.752)	**
LCapFix2(1)	1.483	(0.694)	**
LCapFix2(2)	1.360	(0.636)	**
LCapFix2(3)	1.236	(0.578)	**
LCapFix2(4)	1.113	(0.521)	**
LCapFix2(5)	0.989	(0.463)	**
LCapFix2(6)	0.865	(0.405)	**
LCapFix2(7)	0.742	(0.347)	**
LCapFix2(8)	0.618	(0.289)	**

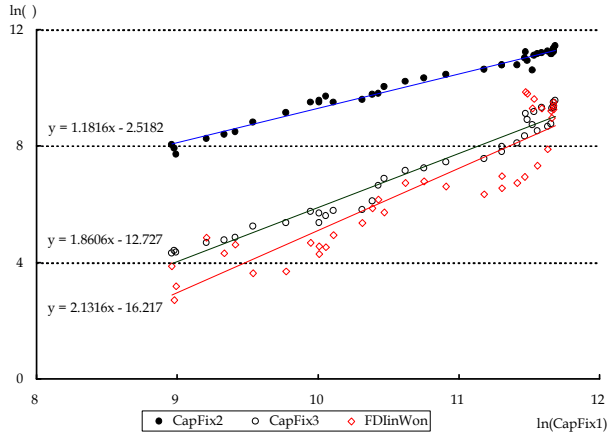
LCapFix2(9)	0.495	(0.231)	**
LCapFix2(10)	0.371	(0.174)	**
LCapFix2(11)	0.247	(0.116)	**
LCapFix2(12)	0.124	(0.058)	**
DW	2.042		
RMSE	0.669		
AIC	58.7		
Total R^2	0.918		

Note: The numbers in parentheses are standard errors. *, **, *** stand for the significance level of estimate at 0.10, 0.05 and 0.01 level respectively. EmpRate=employment rate, EmpRate=1-year lag of employment rate, BC=business cycle indicator, LCapFix1(ρ) and LCapFix2(ρ) stand for log of construction and facilities investment, with ρ lags (ρ = 1, …, 12).

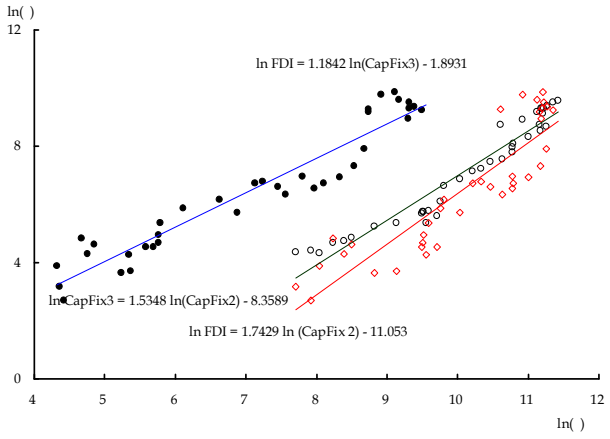
Appendix C

Figure C Long-term relationships among types of investment, 1970-2007

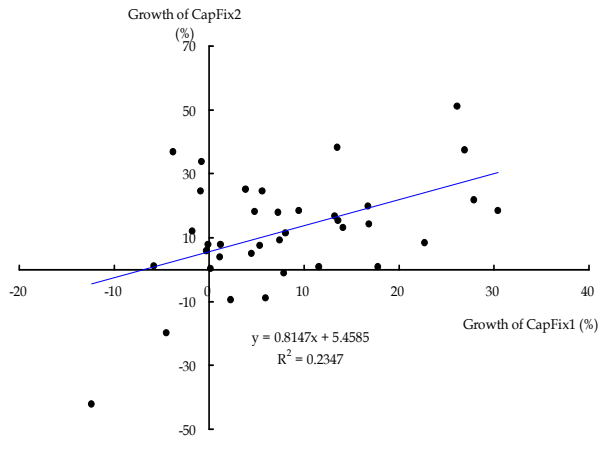
1. Relationship with construction investment level



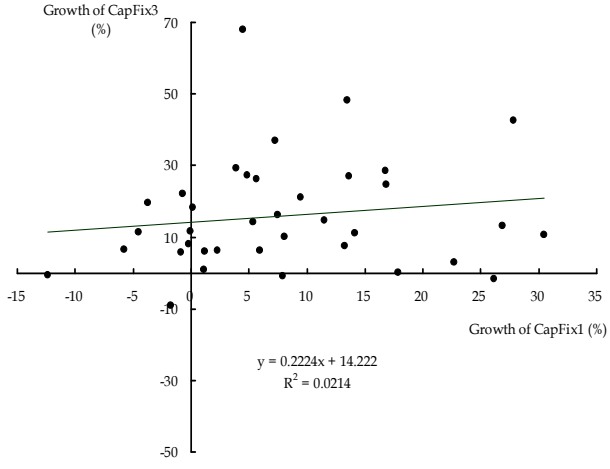
2. Other level relationships



3. Growth rates of construction and facilities investment

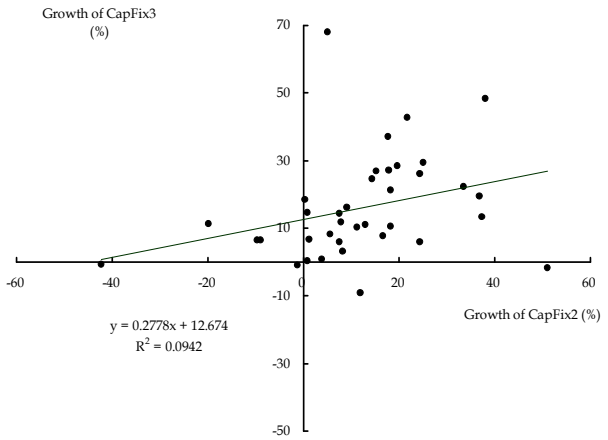


4. Growth rates of construction and intangible asset investment

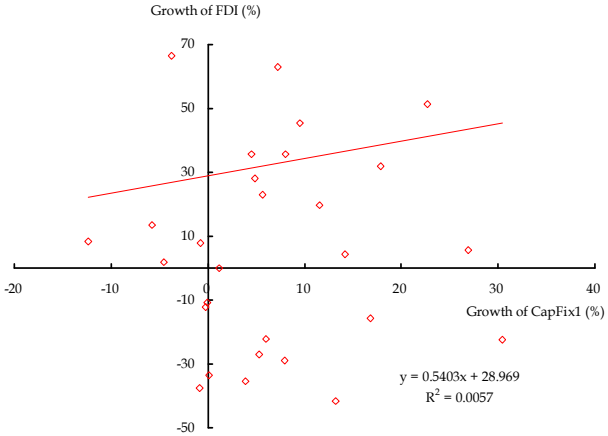


5. Growth rates of facilities and intangible asset investment

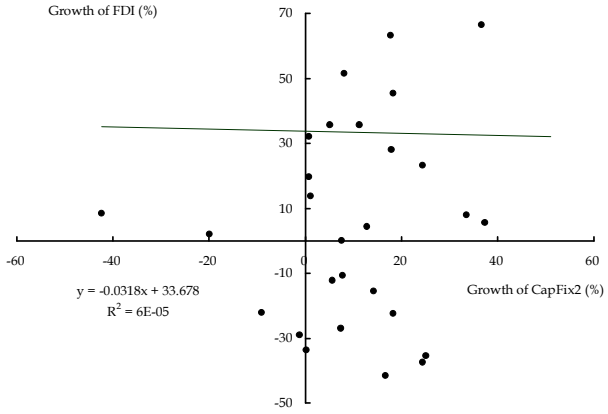
6. Growth rates of construction investment and FDI

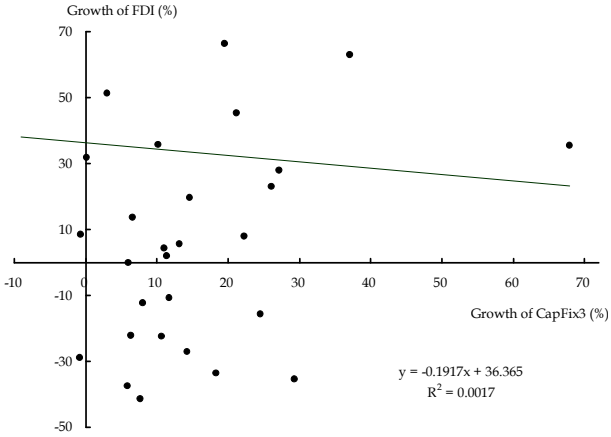


7. Growth rates of facilities investment and FDI



8. Growth rates of investment on intangible assets and FDI





Appendix D

Table D.1 Estimates of VAR for four types of investment, 1970-2007

VAR(1)	Y_1			Y_2			Y_3			Y_4		
Constant	2.140	(1.033)	**	1.513	(1.662)		-1.423	(1.562)		-2.667	(7.011)	
Trend	0.056	(0.019)	***	0.123	(0.031)	***	0.058	(0.029)	*	0.108	(0.131)	
Trend²	-0.001	(0.0003)	***	-0.002	(0.0004)	***	-0.001	(0.0004)	*	-0.001	(0.002)	
BC	0.014	(0.006)	**	0.039	(0.010)	***	0.013	(0.009)		0.046	(0.042)	
Y1(-1)	0.592	(0.132)	***	-0.006	(0.212)		0.344	(0.199)	*	0.310	(0.894)	
Y2(-1)	-0.056	(0.094)		0.260	(0.151)	*	-0.253	(0.142)	*	-0.492	(0.637)	
Y3(-1)	0.161	(0.077)	**	0.195	(0.124)		0.732	(0.116)	***	0.103	(0.522)	
Y4(-1)	-0.053	(0.025)	**	-0.118	(0.040)	***	0.047	(0.038)		0.617	(0.169)	***
DW	1.223			0.812			1.817			1.899		
F-statistics	754.78			394.11			1197.5			87.38		
R²	0.995			0.990			0.997			0.956		
VAR(2)	Y_1			Y_2			Y_3			Y_4		
Constant	3.634	(1.248)	***	0.320	(1.662)		-2.737	(1.562)		-4.920	(8.472)	
Trend	0.063	(0.019)	***	0.121	(0.031)	***	0.069	(0.029)	**	0.089	(0.130)	
Trend²	-0.001	(0.0003)	***	-0.002	(0.0004)	***	-0.001	(0.0004)	*	-0.002	(0.002)	
BC	0.008	(0.006)		0.040	(0.010)	***	0.017	(0.009)		0.058	(0.041)	
Y1(-1)	0.934	(0.171)	***	0.302	(0.212)		0.172	(0.199)		-1.163	(1.163)	
Y2(-1)	-0.046	(0.102)		0.419	(0.151)	*	-0.066	(0.142)		-0.250	(0.693)	

Y3(-1)	0.073	(0.118)		0.064	(0.124)		0.685	(0.116)	***	-1.241	(0.801)	
Y4(-1)	-0.054	(0.025)	**	-0.152	(0.040)	***	0.040	(0.038)		0.642	(0.168)	***
Y1(-2)	-0.388	(0.166)	**	0.016	(0.212)		0.493	(0.199)	*	1.997	(1.123)	*
Y2(-2)	-0.105	(0.097)		-0.335	(0.151)	*	-0.355	(0.142)	**	-0.863	(0.656)	
Y3(-2)	0.176	(0.109)		0.022	(0.124)		-0.093	(0.116)		1.780	(0.740)	**
Y4(-2)	-0.005	(0.031)		-0.078	(0.040)	***	0.018	(0.038)		-0.060	(0.212)	
DW	2.144			1.314			2.021			1.871		
F-statistics	567.29	***		252.60	***		755.17	***		67.16	***	
R^2	0.996			0.992			0.997			0.970		

Note: Y_1=investment on construction, Y_2=facilities investment, Y_3=investment on intangible assets, Y_4=FDI. Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100).

Table D.2 Estimates of VAR for investment, output and employment

VAR(1)	**Employment**			**GDP**			**Y_1**		
Constant	10.549	(11.603)		58.635	(28.625)	*	2.701	(0.843)	***
Trend	-0.167	(0.344)		3.445	(0.849)	***	0.128	(0.025)	***
Trend²	0.001	(0.005)		-0.052	(0.012)	***	-0.002	(0.0004)	***
BC	0.247	(0.067)	***	0.982	(0.165)	***	0.013	(0.005)	**
Emp(-1)	0.479	(0.188)	**	0.027	(0.463)		0.051	(0.014)	***
GDP(-1)	0.026	(0.043)		0.060	(0.106)		0.006	(0.003)	*
Y1(-1)	-0.934	(1.701)		-4.013	(4.196)		0.475	(0.124)	***
Y2(-1)	-1.187	(1.272)		-16.415	(3.137)	***	-0.316	(0.092)	***
Y3(-1)	3.395	(0.874)	***	4.704	(2.156)	**	0.098	(0.064)	
Y4(-1)	-0.714	(0.271)	**	-2.590	(0.668)	***	-0.046	(0.020)	**
DW	1.633			1.566			1.913		
F-statistics	21.2			10.9			869.0		
R^2	0.884			0.797			0.997		
VAR(1)	**Y_2**			**Y_3**			**Y_4**		
Constant	1.146	(1.762)		-1.843	(1.643)		-7.519	(6.851)	
Trend	0.082	(0.052)		-0.002	(0.049)		-0.246	(0.203)	
Trend²	-0.001	(0.001)		0.0001	(0.001)		0.004	(0.003)	
BC	0.039	(0.010)	***	0.012	(0.010)		0.056	(0.039)	
Emp(-1)	-0.024	(0.029)		-0.041	(0.027)		-0.195	(0.111)	*
GDP(-1)	0.007	(0.007)		0.005	(0.006)		-0.010	(0.025)	
Y1(-1)	0.199	(0.258)		0.559	(0.241)	**	1.485	(1.004)	
Y2(-1)	0.255	(0.193)		-0.149	(0.180)		-0.066	(0.751)	
Y3(-1)	0.224	(0.133)	+	0.768	(0.124)	***	0.548	(0.516)	
Y4(-1)	-0.129	(0.041)	***	0.036	(0.038)		0.549	(0.160)	***
DW	0.811			2.028			1.914		
F-statistics	261.1			857.7			71.2		
R^2	0.990			0.997			0.962		

Note: Emp=level of employment, Y_1=investment on construction, Y_2=facilities investment, Y_3=investment on intangible assets, Y_4=FDI. Coefficients with ***, **, * stand for statistical significance at 0.01, 0.5, 0.1 level respectively. The numbers in parentheses are t-statistics. *Trend* = Year – 1969; *BC* = Business cycle indicator (2005 = 100).

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